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Economic development of the livestock industry in Iran

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Figure 1. Map of Iran and location of Centeral Ostan (Tehran)

NOTE ON IRANIAN AND GREGORIAN CALENDARS AND IRANIAN CURRENCY

The Iranian Solar year (which was used in this study) is different from the Gregorian calendar. The Iranian year starts at the beginning of Spring (March 21) with approximately 621 years lag behind Gregorian calendar. For simplicity, the following table is used to relate Iranian years with Gregorian years in the period of 1960-75.

Gregorian Year	Iranian Year
1960	1339
1961	1340
1962	1341
1963	1342
1964	1343
1965	1344
1966	1345
1967	1346
1968	1347
1969	1348
1970	1349
1971	1350
1972	1351
1973	1352
1974	1353
1975	1354

Currency

The currency of Iran is rial. Iranian rial is pegged with Special Drawing Rights (SDR), which fluctuate as exchange rates parity changes. In 1976-77, the exchange rates between rial SDR and dollar was as follows:

SDR 1 = 81.643 rials

$1.00 = 70.625 rials

CHAPTER I. INTRODUCTION, SCOPE OF STUDY, METHODS, PROBLEMS, AND REVIEW OF OTHER STUDIES

Introduction

The agriculture sector in Iran is a major part of the Iranian economy. Forty-seven per cent of the Iranian labor force was employed in that sector in 1971. Agricultural activities are found all over the country. Livestock sector is the main sub-sector of Iranian agriculture. In one estimate by ILO in 1972, this sub-sector has contributed up to fifty per cent of agriculture's share of the GNP (43). The livestock industry has also contributed significantly directly, and indirectly to Iranian exports.[1]

In the development process, a rise in level of income is accompanied by greater consumption of food, in particular of livestock products (55). The red meat consumption has increased from 350 to 455 thousand tons during 1970-74, which is due to a high population growth at 3 per cent and income per capita growth around 15 per cent annually. Meanwhile, the supply of meat and dairy products (which Iran once exported) has substantially lagged behind. Per capita daily calorie and animal protein consumption is estimated to be 2132, and 12.6 grams, amounts considered low in relation to other countries.[2] In order to meet the supply-demand gap, the

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[1]The carpet industry which on the average contributed 20 per cent of non-oil exports and whose main input is wool (a by-product of livestock industry) is thus indirectly related to the livestock sector. And animal hides and skins which on the average contributed 6.5 per cent of non-oil exports is directly related to livestock sector.

[2]The similar figures for the U.S., Mexico and Turkey are (3100, 64.3), (2592, 22.1) and (2534, 17.9) respectively (30).

import of red meat increased more than 10 times, from 6.8 thousand tons in 1970 to 64 thousand tons in 1974. However, the supply of meat from foreign and domestic production was not enough, and demand pressure pushed up the price of meat more than 81 per cent during those years. The increase in meat prices could have been higher if government had not intervened by fixing prices and giving subsidies. The direct result of government price control was a scarcity of meat in Tehran and other big cities.

The strong desire of Iranians for mutton and lamb, along with limited resources for the expansion in supply of these particular meat products has given the opportunity to develop other types of meat production in Iran. Feed-resource scarcity and institutional factors restricted development of livestock industry in Iran.

Scope of This Study

The major focus of this study will be an analysis of red meat and poultry supplies in Iran. Demand for meat is generally a function of population, price, and income per capita, where supply depends on feed resources, prices and number of livestock. More specifically, demand for meat is affected by rate of growth of population, age composition, urban/rural ratio, present level of meat consumption, taste and preference of consumer, rate of growth of per capita disposable income, income demand elasticities and prices. Factors affecting the supply of meat are: numbers of animals, feed-resources development (forage, grain, residue of crops and food processing factories), technological advancement in meat production, and governmental policy. This study attempts to discuss all

the above factors and other related problems in the meat market in Iran.

Importance of Regional Study

In order to eliminate heterogenity among a class of livestock activities for meat production in Iran, a regional analysis is considered best for this study. The central province (Tehran Ostan), the most populous and the second largest state in Iran has been selected for its special economic characteristics (such as the largest deficit area, access to information and statistics and high ratio of urban-rural population) for investigation of the process of developing the livestock industry in Iran.

Tehran is the biggest consumption center for meat in Iran. The availability of such a large market with a high level of income relative to other parts of the country has attracted large amounts of investment for livestock production in this area. The concentration of commercial firms in feed-mixing factories, poultry production, dairy production, and feed-lot operations in this area has contributed the major portion of poultry meat and dairy supplies to the Tehran market. The activities of these commercial firms make the selection of Tehran Ostan more interesting in comparison with other areas in order to study traditional system versus commercial.

Although all types of livestock husbandry can be found in this province, nevertheless, sheep, goats and cattle are imported from all over the country for meat consumption in Tehran. Tehran Ostan has become increasingly a major supplier of meat for its rapidly growing livestock consumption. In particular, poultry-eggs and dairy production in this

area are responsible for the entire supply of these products for the Tehran market.

Problems and Methods

The problem of how to meet the demand for meat in Iran can be analyzed in different ways. One can assume that price changes will adjust to the demand for and supply of meat and bring equilibrium in the market. At higher prices, meat consumption is curtailed, whereas, on the contrary, producers are encouraged to increase production and to allocate more resources for meat production. If this is the case, it must be asked what the effect of higher meat prices on social welfare and the economy will be.

In an open economy (with no barrier for imports or exports) one has to deal with the balance of payments problem. From the balance of payment point of view, the problem of how to cope with the foreign exchange burden arises due to limited feed resources, more meat production requires more feed imports.

Several other questions must also be posed before an optimum meat supply for Iran is achieved. These include whether feed imports should be encouraged in order to produce more meat domestically or whether meat should be imported to compensate for the meat deficit. Which one will cost less to the consumer and exhaust foreign exchange to a lesser extent will have to be determined. The consumers' preference between domestic and imported meat, and among different types of meat -- lamb, beef, and poultry -- the one most preferred by the consumers must be considered. Further, which of these is more efficient and expandable in terms of

production will also have to be discussed.

It must also be determined what techniques of meat production -- extensive versus intensive or labor intensive versus capital intensive -- should be used to produce various types of meat, given limited resources. A final consideration is what kind of feed resources must be developed to achieve higher meat production at minimum cost, where there is competition for direct human consumption for water and land resources.

Various problems related to the above-mentioned questions, such as institutions, culture, and national policy must be considered in planning for livestock development in Iran.

In order to achieve an optimum solution with specified restrictions in production, resources or costs, mathematical programming is considered an appropriate method with certain advantages. Among the different types of mathematical programming, i.e., linear, non-linear, etc., linear programming is extensively applied in agricultural as well as in non-agricultural studies.

In order to analyze the alternative methods of livestock production in Tehran Ostan, linear programming methods are considered the most suitable. Linear programming models have been used mostly in studies of agricultural planning at both the farm and regional levels in order to determine optimum allocation of resources among different products in regard to minimizing various costs, maximizing net income or certain goals.

The flexibility of linear programming in the context of farm-planning application is considered its most important advantage. Manipulation of the constraints, activities and objective functions make it possible to examine different types of technology, resources, and price adjustments

in regional studies.

Linear programming methods are used in this study to obtain answers to some of the problems in Iran discussed previously. To investigate the different objectives in meat production by linear programming, several different assumptions such as minimization of costs for fixed quantities of meat demand, maximization of output for limited resources and restrictions of total foreign exchange spent on imported capital and feed grain quantity will be examined in analyzing Iranian livestock development.

Technological innovation effects on structure of livestock industry needs careful examination. The linear programming method is one of the best tools for examining this type of problem. Changes in technical coefficients over time considered in a linear programming framework as the most appropriate way to investigate the effects of changes in alternative methods of meat production.

The competition among different animal, different sources of feed, scale of production, and use of more capital intensive techniques of production can be studied by using a simulation model. The taste and preference of consumers can be reflected in linear programming model by incorporation of minimum demand requirements into the model. The effects of changes in feed and meat prices will be examined in this study. A normative supply schedule for meat production in Tehran Astan can be derived by using parametric programming.

The results of the analysis in the final chapter of this dissertation will be in the form of recommendations for future development of the livestock industry in Iran and further study in this subject from the different viewpoints.

Review of Other Studies on This Subject

The livestock sector in Iran is one of the major portions of the Iranian economy which accounts for approximately 10 per cent of the share in GNP. Prior to 1960, Iran was a net exporter of livestock and livestock products. Some types of technical and descriptive studies of the livestock economy of Iran were made during this period. Despite some major problems during this period, a low rate of lambing, a high rate of mortality, a seasonal meat scarcity and a low rate of slaughtered animals, meat supply was growing faster than demand. Low level of income and a low rate of population growth (around 2 per cent) caused low rate of growth of demand for livestock products. This along with the growing number of flocks of animals produced by tribes and villagers resulted in an excess supply of meat, leading to increasing Iranian livestock exports inspite of all problems.

Several studies in the 1960's by Haynes (39) and Plan Organization (8) paid much attention to prospects of feed scarcity and over-grazing of rangelands by nomadic and village livestock producers. An increase in the area under cultivation, the fast rate of growth of the population, income per capita, and simultaneously limited range capacity and slow development in the growth of the other feed supply made inevitable a serious meat and dairy products shortages in the near future. In particular, studies by the Food and Agricultural Organization of the United Nationa (FAO) (30), and several other studies (U.S. AID and Tahal Consultant Company) in addition to the problems mentioned above, suggested that a growing deficit in feed supplies would occure. In the future, the supply-demand gap of meat and dairy products would widen.

Haynes (39) in 1965 estimated 41 per cent of livestock weight losses from winter starvation, and from fall and spring migration by nomads. In addition, he estimated 14 per cent loss in liveweight animals due to starvation, disease, snow, and floods. The total 55 per cent loss is the potential capacity to increase meat production with the present number of livestock. Based on Haynes estimation on the feed potential supply in Iran, even with utilization of all potential opportunities, there would be 16.5 per cent less per capita domestic supply of meat and milk by 1975.

For several years, due to a growing demand in the Persian Gulf Emirates for sheep and goats, their proximity to parts of Iran and similar tastes for meat in Persian Gulf, Iran was a net exporter of sheep and cattle until 1967. However, from 1967 on, exports of livestock showed a decline and imports increased rapidly. In the late 1960's and early 1970's, livestock economy of Iran became the focus of many studies from different points of view.

LeBaron (50), Ronaghy (86), and FAO Commodity Projections (30) made a long-term projection for supply and demand of agricultural commodities including livestock products. All studies emphasized the seriousness of the demand-supply gap in the very near future for meat and other livestock products.

Based on different assumptions of past and future population, income per capita growth and income demand elasticities, these studies arrived at different levels of meat consumption for the future. Supply projections were made based on livestock population, techniques of production and water and land resources available for feed and meat production

in 1975, 1980 and 1985.

Since these early studies, there have been no basic reliable data on livestock population, slaughter rates and weight of animals. Their supply projections vary from each other in comparison with demand projections. Ronaghi bases his supply projections on past trends of the growth rate of the agricultural sector (yield and land development, and the fourth development plan targets with some modification) and came up with a 3.49 per cent annual average growth rate during 1965-85. The total percentage increase during 1965-85 for all meats (including fish) was 122.15 per cent or an average growth rate of 2.7 per cent. Ronaghy generalizes that the supply growth of agricultural products does not reflect the effect of limiting factors on a specific area such as rangelands, trade-off between different products (meat and feed), and resources in the long run.

LeBaron's projections are more specific on items of agricultural products. The supply of agricultural products is projected, as he stated, exclusively on apparent technological potentials for future production, given arable land, expected water supply, yield and introduction of modern cultivation practice. The livestock supply projection, on the other hand, is based on potential future increases in animal numbers which are linked to estimated future feed availability from crops and crop residue (50). Table 1 shows the projected deficit for red meat and poultry from different sources in 1980 and 1992. The projected meat deficit in 1992 is around one million tons which is more than 15 times of Iran's present meat imports.

FAO and several consultant companies to the Iranian government made

Table 1. Projected meat deficit in Iran (In Thousand tons)

	1980			1992		
	Mutton	Beef	Poultry	Mutton	Beef	Poultry
Plan Organization	--	--	--	986	--	--
IBRD	--	--	--	575	214	--
LeBaron	76.2	53.8	49.7	--	--	--
FMC	--	--	--	670	262	86
Bookers and Hunting Ltd.	--	--	--	954	234	--

several studies concerning livestock development plans in Iran. A study by a team from the United States Department of Agriculture (USDA) (97), two consultant companies, Food and Machinery International (FMC) (32), and Bookers and Hunting Ltd. (22), and several other studies in regional development were sponsered by the Ministry of Agriculture and Natural Resources.

Among these studies, that of the Animal Protein Development Program by FMC and the USDA on livestock development in Iran are the most comprehensive studies in livestock planning.

The USDA mission report, in particular paid more attention to the problem of feed supply in Iran. The study concerns feed production, range management, and other livestock production aspects, mainly from the technical point of view. The National Cropping Plan (NCP) by Bookers and Hunting Ltd. (22) utilized the linear programming methods to investigate the optimal planning for the future of the agricultural sector in different regions of Iran, also including the livestock sector as an integral part of cropping plan in their study.

The Plan Organization, in planning for the agricultural sector in the Third, Fourth, and Fifth Development Plan (1962-77), recognized the red meat shortages, but underestimated the extent of excess demand (8). In particular, it mentioned the substitution of white meat for red meat as a solution for red meat shortages.

All these studies reached the same conclusion: That there is an acute deficit in the future of the livestock sector in Iran. This lack could become a burden on foreign exchange spending, as the demand for animal products increases faster than does its domestic supply. The

conclusion of these studies was that self-sufficiency as a major goal of government in agricultural products, in particular livestock products as set forth in the Fifth Development Plan does not seem possible in the near future. However, the extent of deficiencies and policy recommendations varies from one study to another. A lack of data, contradiction among that available, and priority in the development of particular crops at the expense of others are factors responsible for some of the differences noted.

The implementation of these programs (FMC and NCP) needs more capital investment, extensive networks of extension services, institutional adjustments, intensive research and development, and reallocation of resources in the agricultural sector. One of the policy instruments to remedy the deficiency in animal products is changes in the relative prices of agricultural products and input prices. However, due to governmental policies toward many other social and political, as well as economic factors, in other sectors of economy such as employment, rural-urban migration, stability of prices, industrialization programs, and income distribution, a policy of drastic price change is not easy or advisable in most cases. Price variation changes, demand and also profit margin and cost of production determine a supply schedule. But without consideration of many restrictive variables in the overall economy, the price policy recommendation is considered the most controversial in the Iranian economy. The enactment of such policies requires thorough examination of all direct and indirect effects of the policy implementation.

Limiting factors in the supply of agricultural products in Iran are many, but the most restrictive one considered by many studies is the

water supply. However, in addition to water supply, the contribution of other factors in the productivity of agriculture (crop production per hectare or number of labor days for one ton of crop production) are so important that technological development (more research and use of fossil fuel) could have substantial effects on improving productivity and supply expansion. More research and development, larger scale of production, expansion of extension services, and improvement in marketing of feed and livestock products, to name a few, are suggested by most of the studies (97), (26), (91), as usable key factors in increasing productivity in the livestock sectors in order to meet the widening gap between demand and supply of meat in Iran.

The intensification of supply of animal products, i.e. increased productivity in per unit of production, has been suggested as the most suitable policy in livestock development in Iran by FMC (32), Bookers and Hunting Ltd. (22), and Brown et al (26). An alternative policy is the discontinuation at the extensive production of livestock products as practiced in the past (migration of livestock from one area to another, and livestock dependency on pasture as the only source of feed) with the present scarcity of water and rangelands as a possible solution to the future demand for meat in Iran, stated by FMC (32), USDA (97), and FAO (30).

The introduction of feed-lots for meat production in Iran is still in the experimental stages, and due to the short experience of Iranian livestock producers in this field suggested programs, as suggested by FMC (32) must be considered with certain reservations before the

completion of programs.[1]

Changes in the type of ownership, scale of production, and capitalization of livestock industry, proposed by FMC need basic institutional and social changes and in addition to rate of return and profit margin, a cost-benefit analysis study from social as well as other economic goals is necessary.

A reduction in the number of livestock in order to decrease pressure on rangelands is suggested as a policy which could increase meat production from the available feed resources to some extent (97). Due to use of a large number of stock from limited feed resources, many of the animals are undernourished (below maintenance level). High mortality, low productivity, and light weight slaughtered animals confirm indications of feed resource scarcity. However, this policy needs careful examination of range capacity in each area, and allocation of livestock based on range capacity, which requires extensive networks of experts and law enforcement.

The Bookers in the NCP concluded that, meat production is extremely costly and it would yield little in terms of value added to agricultural sector and suggested government must take an appropriate nutritional policy for Iran to develop non-animal sources of protein.

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[1]Sheep fattening in winter has been practiced for many years, but full house-confinement for sheep and beef production is a new adventure in Iran and livestock producers are not familiar with this type of production.

CHAPTER II. GENERAL REVIEW OF IRANIAN ECONOMY

The Iranian economy has undergone dramatic changes in recent years. Iran is the second largest oil exporter in the world. Oil revenues represented 45 per cent of gross national product in 1974. Oil revenues have become so important that any fluctuation in production or the price of oil has a direct effect on all sectors of the Iranian economy.

The oil sector's contribution to the gross national product at current prices rose from 18.1 to 45 per cent from 1970 to 1974. However, in 1975 there was a lower demand for oil. Iran's oil export decreased and the share of oil in the gross national product dropped to 36.8 per cent.[1] Iran, like several other oil exporting countries, relies on oil income to make investments for economic development to cover current government expenditures, and to provide foreign exchange. In a way, the Iranian economy is a lopsided economy with the oil sector, capital intensive, modern, advanced technology and all other sectors of the economy clearly not so developed.

The expansion of Iran's economy in the past five years has been tremendous by all measures. Gross national products (GNP), at current prices, increased on the average by 38.4 per cent per year during 1970-75.[2] Per capita GNP increased at 33.5 per cent per year. However, inflation was high especially in 1973, 1974, and 1975. The GNP growth

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[1] The world demand for oil dropped 2.5 per cent against an anticipated 5 per cent increase in 1975.

[2] The similar figure for Saudi Arabia is 35.4 per cent (1969-1974).

in 1970 prices was 24.3 per cent per year (see Table 2).[1] Still a rate of average rial growth of per capita GNP of 30.390 per year under normal circumstances is very high and considered without precedent in the history of Iranian economy.

The per capita GNP at current prices in Iran reached over 1600 dollars in 1975 (from 335 dollars in 1970) which, based on a per capita classification, places Iran in the list of developed countries. Perhaps the per capita income criterion in this regard is imperfect or somewhat misleading. Other criteria, such as one suggested by Bennett (19) might give better indications of welfare and the standard living of people. Bennett's criteria are various indices of the level of living, such as calorie intake per capita, infant mortality, manufacturing, energy, the number of physicions, etc. For example, the per capita electricity consumption in Iran is approximately 400 kilowatts, which is lower than in many other countries with a similar per capita income.

Table 2 shows the per capita income of Iran during the period 1970-75 at current prices and at 1970 constant prices. Although per capita income has increased sharply in fixed and current prices, nevertheless, in 1974, the per capita income in current prices was two times greater that per capita income in fixed prices. A comparison of these two figures reveals that per capita income in current prices from 1970-74 has increased by more than four times, whereas per capita income in constant prices has increased by 95 per cent simultaneously. This difference can be accounted for by the high rate of inflation in this period.[2]

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[1] During 1960-70, the average GNP's growth at current prices was 11.4 per cent and at fixed prices, growth was 8.2 per cent.

[2] In 1974 Gross Domestic product increased by 70 per cent in current prices over the previous year, but increased by 13.4 per cent in fixed prices.

Table 2. Gross National Product per capita income, fixed capital formation at current and 1970 prices and share of fixed capital formation in GNP at current prices.

Items	1970	1971	1972	1973	1974	1975[b]	Growth 1970-75 Per cent	Growth rate annually
Gross national products (GNP) at current prices (billion rials)	740.6	913.7	1183.1	1824.7	3150.9	3637	391	36.9
Per capita GNP at current prices (rials)	25,313	30,436	38,271	54,271	90,720	107,022	322	33.5
Gross national products in 1970 prices	740.6	866.0	1055.3	1398.4	2067.4	2119.1	186	30.9
Per capita income at 1970 prices (rials)	25,313	28,849	34,140	43,556	63,043	64,619	155	30.3
Gross fixed capital formation at current prices (billion rials)	167.3	203.3	287.4	363.3	563.1	1100.2	557	36.6
Fixed capital formation at 1970 prices (b. rials)	167.3	192.5	256.3	291.5	384.9	695.4	315	33.4
Share of gross fixed capital formation in GNP at current prices	22.5	22.2	24.2	20.8	17.8	30.2	34	26.6

[a]Sources: Annual report of Bank Morkazi Iran (13), (14).

[b]Preliminary estimate on national income of Iran.

Role of Oil in Iran's Economy

The major factors determining Iran's national income is the increase in oil prices and the increase in oil production. During 1970-74, oil production in Iran increased 91.3 per cent, however the earnings from oil exports increased more than 15 times (see Table 3).

Current government expenditures increased sharply and in particular defense hardware allocations increased, as income became available. All the funds which could be effectively used were allocated for economic development and investment projects.[1]

There is a significant role for capital investment in national growth and development. Rostow estimates that the take-off stage in economic development requires an increase in savings rate from 4-5 per cent to 12-15 per cent of national income. Only a few other countries have had savings and investment rates as high as the 30 per cent of national income Iran experienced in 1975. However, capital investment rate is only one determinant of rate of economic development. Countries with the same capital investment rate have had different rates of economic development.

In Iran, the capital investment rate has generally been between 20-25 per cent of national income in the last decade (see Table 2). The 1974 rate was 18 per cent. Iran's economic growth measured by per capita income at constant prices was 30 per cent per year from 1970 to 1975. 1975 was an exception when real per capita income grew at a rate of 2.5 per cent.

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[1]Investment projects included military as well as civilian, there is no data available separately for amounts allocated to each sector.

Table 3. Iranian oil exports, oil revenue and oil price, by years from 1970 through 1974

Item	Unit	1970	1971	1972	1973	1974	per cent increase 1970-74
Total oil and oil product exports	Millions of metric tons	181.6	219.7	250.3	279.8	278.1	53
Refined oil product	Millions of metric tons	16.5	16.0	15.2	14.9	14.5	87
Oil income	Dollars	6.29	9.08	9.57	16.97	66.60	958
Income from oil exports	Millions of dollars	1,143.5	1,995.8	2,397.0	4,750.4	18,522.3	1519

[a]Sources: Bank Markazi Iran; Annual reports (13), (14).

In Iran, private investment is concentrated in the housing and trade. Government investment is concentrated on infrastructural and heavy industries. However, in Iran, government investment directly or indirectly affects all sectors of the economy.

In the revised Fifth Development Plan (1972-77), the volume of public investment was predicted to be more than two times that of private investment.[1] Governmental investment policy plays a significant role in the development and growth of the Iranian economy.

Balanced Growth

In the Fifth Iranian Development Plan, targets to be reached were set forth; first, balanced growth in the economy and other goals, more equal distribution of income, high rate of growth, and price stability.

The balanced growth goal does not imply the same growth rate for each sector, but rather that government investments in different sectors should be "mutually reinforcing," such that overall new supply will "create its own demand" (66). "Balanced growth" should insure that the efficiency and productivity of each successive investment should rise. Developing countries must rely on their own domestic markets to obtain full employment. The balanced growth means ex-

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[1]Public investment in India during the Second, Third and Fourth Development Plans were 54.1, 60.5 and 60.3 respectively of total investment (99).

pansion of domestic markets, as a result of investment allocations. Investment allocations should be made among all sectors so as to create an environment which makes each investment project fully productive and hence optimum. Faster, more efficient growth can be achieved by a balanced growth policy.

Critics of "balanced growth" mention two limiting factors, capital and foreign exchange. To achieve the optimum level of investment in all sectors, "unlimited" investment capacity and foreign exchange must be available. Foreign exchange limitations can limit total investment, since most investment projects require the importation of some foreign machinery and techniques.

Nurske accepted the tenet that balanced growth is in capital limitations, that "balanced growth is an exercise in economic development with unlimited supplies of capital, analogous to Professor Lewis's celebrated exercise in development with unlimited labor supplies" (66). Therefore, he implicitly accepts that his theoretical idea might not be a practical economic theory under most circumstances.

In Iran, whose oil export revenue puts its economy into a category most like that of a "planned economy" rather than free enterprise, some of the above-mentioned problems have not been considered major ones. Most public investment decisions are made based on government priority

indices, and vast amounts of oil revenue are allocated to achieve certain goals without regard for profit maximization. The vacuum of private sector incentives is some sectors of economy is mostly filled by public investment, and for most projects the limiting factors seem not to be the market size. Therefore, the advantages of a balanced growth in Iran can be stated as increased efficiency and productivity in all sectors of the economy in which the planners thought it would be possible with the huge oil income.

It is true that capital is not limited to a certain degree in Iran, but even unlimited capital cannot solve the problem of achieving a set of goals which sometimes are contrary to each other, and to efficiency and productivity in a short time period. The limitation of human resources, insufficiency in the infrastructure and the time period can aggregate problems which limit economic growth and development.

However, the brief experience of the Iranian economy with unlimited capital came to an end in 1975, showing that there are some problems. The time lag in particular, exist always. At the present time, capital limitations are also added to the other limiting factors, causing a slower growth rate previously expected.[1]

Imports and Exports

Economic development and growth can be accelerated through interna-

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[1]Prior to the revision of the Fifth Development Plan, the priority of industrial development helped to deteriorate income distribution. The policy of relative stability of prices also hampered development of the agricultural sector, although all of which were mentioned as target priorities. However, in the revised plan, it is assumed that the above-mentioned problems can be solved under unlimited capital resources.

tional trade expansion. Indeed, in some cases, this is the only way to achieve high living standards and development. Technological know-how can be transferred via international trade by countries. In most developing countries, studies have shown that one of the limiting factors is import constraints, where foreign exchange limitations impose a certain rate of growth (1). The theories of export promotion or import substitution and other models of economic development such as McKinnon's two-gaps model, saving/investment and foreign exchange constraints (53) emphasized the role of foreign exchange constraints in planning for economic development and growth among countries.

Industrial development and mechanization of agricultural sector are linked with international trade. Industrialization required imports of capital goods and techniques from industrial countries in order to increase exports or decrese imports.

As a result of the increase in revenues from oil exports and the availability of foreign exchange, Iranian imports increased sharply during 1970-1975. Oil and gas exports have increased by more than 16-fold, while imports of goods increased around 4 times from 1970-74 and more than 6 times from 1970-75. The total imports have increased from 1.6 billion dollars in 1970 to more than 6.6 billion dollars in 1974. The imports' share in the GNP decreased smoothly from 17 to 15 per cent simultaneously. As an indication of the direct relationship between imports and exports, the share of oil and gas exports in the GNP increased sharply from 11.7 per cent to 42.3 per cent in the same period.

The slow rate of increase in oil prices by 6 per cent and a drop in oil demand in the world market caused the oil revenues from exports to

increase by only 2 per cent in 1975, reaching a sum of 19 billion dollars. The share of exports in the GNP dropped to 37 per cent simultaneously. However, despite the slow rate of increase in oil revenue from exports, imports increased by more than 70 per cent in 1975, to a level of 11.3 billion dollars, which accounts for 22 per cent of GNP.[1] The total of 1975 imports is more than 6.7 times larger than that of 1970 and could have been more if the port congestion had not stopped orders from foreign countries.

Oil and gas exports constitute the bulk of Iranian exports, accounting for more than 75 per cent of foreign exchanges in foreign accounts in 1970, increasing to 89 per cent in 1974 and dropping slightly to 87 per cent in 1976. Non-oil exports are not considered a major source of foreign exchanges in Iranian economy. In 1970 foreign exchange from non-oil exports was only 272 million dollars, compared to 1,677 million dollars from petroleum products. However, as oil exports increased by more than 16 times during 1970-75, non-oil exports did not keep the same rate and increased by only 2 times. Most Iranian non-oil exports should be considered as residue of domestic demand, and as income increases domestic demand will curtail exports of commodities. In 1974, the value of Iranian exports of commodities, despite the increase in world prices, decreased by 9 per cent with respect to the previous year's record. Domestic demand absorbed most commodities which could have been exported if the increase in the consumption could remain the same. In 1975 the

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[1] Infrastructural inadequacies are responsible for the lag of imports and the higher costs of imports. An average of more than 240 ships because of congestion of Iranian ports waited for unloading in 1975. The surcharges on imported goods cost more than one billion dollars in one year to Iranian consumers.

volume of non-oil exports decreased again by 31 per cent but increased by 2 per cent in value terms; still lower than the 1973 record.[1]

Table 4 shows a summary of Iranian import values, exports, share in the GNP, rates of growth and oil and gas exports as percentages of current accounts in the balance of payments during 1970-1975.

Due to a smaller increase in oil income in the future as anticipated, Iranian imports will not increase at the same rate as in the last three years. However, the surplus in the current balance of payments is expected to change to a deficit before 1980. In general, imports in Iran will depend on oil income, investment projects, absorption capacity of the country, exports of non-oil, and capital inflow into the country. Iranian exports, on the other hand, depend on natural resources, domestic consumption, and expansion of agriculture and industry.

Industrialization, in particular will rely heavily on imported materials for a long time; therefore, import expansion to some extent will depend on public and private funds devoted to the development projects in all sectors of the economy.

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[1]Agricultural and agricultural-based products constituted more than 80 per cent of Iranian non-oil exports in 1975.

Table 4. Trade and Gross National Products relationship (1970-1975)

Accounts \ Year	1970	1971	1972	1973	1974	1975	percentage growth 1970-74	percentage growth 1970-75
GNP (current in dollars)[b]	9,775	12,056	15,611	25,625	44,045	51,276	35.0	59.2
GNP (current in billion rials)	740.6	913.7	1,183.1	1,742.5	2,975.1	3,615	30.1	38.7
Oil and gas exports	1,149.5	2,030.8	2,460.2	4,937.7	18,653.5	19,026	15.22	15.55
Non-oil exports	272.6	334.6	439.8	634.7	581.5	594	11.3	11.7
Imports	1,677	2,061	2,570	3,737	6,614	11,300	29.4	57.3
Oil exports/GNP %[c]	11.7	16.8	15.7	19.2	42.3	37	26.1	21.6
Oil and gas exports as percentage of current accounts in balance of payments	75.4	78.6	77.8	81.0	88.9	87.0[d]	18	15
Imports/GNP %	17.2	17.1	16.4	14.6	15.0	22.0	--	--

[a]Sources: Bank Markazi Iran (13) (14).

[b]Iranian rials were converted into U.S. dollars at the following average annual exchange rates: 1972/73 rls 75.786 = U.S. $1; 1973/74 rls 68.00 = U.S. $1; 1974/75 rls 67.547 = U.S. $1; 1975/76 rls 70.50 = U.S. $1.

[c]Only oil exports calculated, not "oil sector" which included domestic oil and other related activities.

[d]For 1975 only oil exports calculated, not oil and gas.

CHAPTER III. AGRICULTURE AND LIVESTOCK SECTORS IN IRAN

Agricultural development involves a dynamic process of adjustment to original resources and to the accumulation of new resources over time. Industrialization is required to absorb over-crowded agricultural labor and bring new techniques of production to the agricultural sector. Industrialized countries have been successful in increasing agricultural production by using more science-based technology than have developing countries through expansion of resources in recent year (38).

Agricultural development and growth in Iran has lagged behind other sectors of economy in recent years. The limiting resources in Iranian agriculture are numerous, but the most obvious one is the scarcity of water, a problem long recognized. Most development projects in the past were aimed at providing water for agriculture and urban population. The population distribution pattern is also a good indicator of water availability in Iranian regions. High population density in the north, northwest, and central parts has adjusted to the relative abundance of the water supply in these areas.

Crops and livestock distribution also follow the same rule. Except for wheat, essential to Iranian diet and found everywhere, the types of crops and livestock in each region depend on the water supply. Livestock distribution is scattered vastly all over the country, but the concentration of livestock follows the high mountain ranges. Large flocks of sheep and goats belong to nomads whose main activities are livestock husbandry and were the major sources of meat and dairy products in Iran. Villagers usually combine the livestock activities as a supplement to

their farming activities.

More than 50 thousand villages (Deh) are the units of agricultural based activities in Iran. The population of villages varies from a few families up to thousands of families.[1] Access to communication and transportation is not good for many villages due chiefly to the vastly dispersed distribution of villages and steep mountainous areas in some cases. Wherever there is some water, people have gathered and, regardless of other constraints, have engaged in farming activities. Therefore, Iran's agricultural activities are a collection of many scattered, separated small lands, far from each other.

Only small percentages of Iranian land are cultivable and an even smaller portion of that is utilized at the present time. The total cultivable land is 70.4 million hectares or 42 per cent of the total land, with 20.4 million hectares utilized at the present time. Only 8.2 million hectares or 5 per cent of the total land is annually under crop production. Further classification of land between dry farming and irrigated farming also shows limitations on the type of crop production in Iran. With a low average rainfall (300 mm), irrigation has become much more significant in crop production than in other countries. Irrigated land in Iran constitutes only around 3 million hectares or 1.8 per cent of the total land but produces more than 78 per cent of the total crops in Iran.

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[1] The average land holding per family is 2.8 hectares (irrigated and non-irrigated) in 1972.

Problems of Agricultural Development in Iran

The agricultural sector in Iran, as in many other developing countries is divided into two sectors: modern and traditional. The modern or commercial sector encompasses all agricultural firms best characterized by combination of one or more of the following criteria: high capital intensity, low proportion of self-employed and unpaid family workers, utilization of credit facilities, modern machinery, high wages, cash crops, and modern technology in farming, etc. On the other hand, the traditional sector is composed of traditional units of production which are highly unorganized, small in size, household or family oriented, utilize products locally, and which seldom utilize credit facilities provided by modern financial institutions.

The commercial or modern agricultural firms in Iran were established not long ago. The cotton, chicken and vegetable oil industries are the best representatives of the modern sector. Cotton production in particular has grown in number of hectares and productivity more than any other crop in Iran. As a second major item of non-oil exports, cotton is competing in international markets, in terms of price and quality. The area under cotton production has been stabilized, but yield per hectare increased by 50 per cent from 1960-70 (97). The use of more fertilizer, better irrigation, pesticides, and higher quality seeds is responsible for higher productivity.[1] The extension service plays an important role in increasing yield per hectare by introducing new methods of production, fertilizer, seeds, and credits so that farmers can afford to

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[1]Fertilizer consumption in Iran increased by more than 3.8 times during 1970-75, from 100 thousand tons to 380 thousand tons.

pay the higher costs of expenditures per hectare.

Lack of communication, transportation, storage facilities, and information have limited the traditional agricultural sector's expansion. Although production has increased in recent years, growth in production is mainly due to extensification rather than changes in techniques of production.

Villagers in Iran are almost self-sufficient for major food items. Except for cotton and sugar beets which expanded in the last decade, a small portion of the other crops enter the market. Migration from villages to cities has kept the rural population stable. Industrialization has attracted many unskilled farmers to go to cities for higher wages. Construction jobs in particular are responsible for the absorption of a large number of the rural population in recent years.[1]

The rapid rate of industrialization and urbanization in Iran in recent years which was possible with large amounts of oil revenue caused a large demand for food and raw materials. Under the traditional system of agricultural production, the food supply can increase only by the cultivation of more land. With a lack of water, land utilization is limited to the expansion of the water supply, which is very costly under Iran's circumstances. Hence, cities have been forced to rely on food imports and surplus of agricultural sectors in good years for their food supplies. Except for some provinces such as Mazandran, Gorgan, and Azarbaijan which have major surplus in cereal production, the surplus or deficit in other regions depends on rainfall.

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[1]During 1970-74, wages in construction for unskilled labor increased more than 96 per cent (14).

The migration of the rural population to cities can reduce excess population on the land. Therefore, the size of farms will increase if the industrial sector can absorb enough labor from the agricultural sector. This is what actually happened in developed countries where the larger size of farms made economical the use of machines and new techniques by decreasing costs per hectare.

One has to recognize, however, that unless there is a substitution between labor and other factors of production, population reduction in the agricultural sector per se beyond a certain level, will reduce production substantially. Studies of Dasht Moghan (38) and Gorgan (36) in the north and northwestern parts of the country have confirmed that there are seasonal labor deficits in these areas so that labor must be provided from other provinces or production will decrease. Unless there is a substitution for machines or other techniques of production, the present labor force must be kept in peak season.

Developed countries have succeeded in increasing agricultural production, as Hayami and Rutton (38) stated, by changing their system of production from traditional resources-based to science-based production. The use of fossil fuel in particular is responsible for higher yields per hectare and the ability to increase the size of farms.

Problems in the agricultural sector of developing countries are much different from those in developed countries. Low productivity in the agricultural sector and a low level of income in rural areas call for many explanations in less developed countries. In developed countries, conversely, in the last 20 years, there has been a technical revolution which changed the agricultural sector more than any other industry.

Yields of all crops and livestock enterprise have increased rapidly. The increase in agricultural productivity in the U.K., for example, quite similar to the others, was above the average for the rest of the economy (5). Developed countries were faced with limitations on the demand for foodstuffs which present supply expansion.[1]

The traditional type of farming in developing countries including Iran is responsible for the low rate of growth. Low-level fertilizer utilizations, pesticides, small land ownership, fragmentation of lands, marketing of agricultural products, and, in particular, the lack of capital are some of the problems limiting productivity in these counties.

The "Green Revolution" as one of the greatest achievements of the new technology in agricultural development in the 1960's brought a unique opportunity for developing countries to cope with food supply shortages and increasing their productivity substantially. The use of an optimum combination of different inputs to reap the high productivity of the seed is important in seed utilization. Lack of one of these factors definitely reduces seed productivity.

Studies in South Asia on the effects of the "Green Revolution" on productivity have shown that it had succeeded partially in that area. Farmers with the average or large land holdings were the first to be able to switch to new varieties, whereas, the small land holders could not benefit from the gains from the additional output of foodgrains. In

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[1] In Iran, average productivity in agriculture increased by 2.6 per cent during 1960-71, where industry, oil, and service productivity increased by 5.9, 10.8, and 5.2 per cent simultaneously (2). Similar figures for the U.K. are 5.1, 1.9, 4.9 and 1.4 respectively during 1954-64.

order to increase productivity on small frams, there must be substantial funds channeled into farm production. However, the incremental capital output ratio is very favorable (around 2.2) (26).

Technological diffusion in rural areas is a challenging job and needs substantial extension services and investment. Institutional changes are required in many instances in which new techniques are being introduced to that area. As a result of the introduction of new technology, the income gap between urban and rural areas will widen.

In particular, in the case of small land holders, they cannot afford to use all inputs at the optinum level and the effective use of new technique has been reduced to a large extent. As mentioned above, excess population in some cases has limited the economic use of new technology, therefore, the reduction in population on the land could create an oppotunity to increase farm size and, as a result, increase income in this sector. Although agricultural development and productivity in Iran is limited to some extent by water scarcity, there are still many oppotunities for improvement at the present level of water utilization.

The growth of the agricultural sector in Iran in the process of economic development toward industrialization has been slower than has that of other sectors of the economy in the past two decades. As a result, the agricultural share of the economy in terms of GNP continuously dropped and its position among other major economic groups dropped from the second contributor to the economy to the last one in 1969. Table 5 shows the share of each group in the Iranian economy in selected years.

From an employment point of view, the agricultural sector still constitutes the largest portion of the labor force of the coun-

Table 5. Share of value added in the main economic groups in GNP at market prices in selected years.

year / sector	1959	1968	1970	1971	1972	1973	1974
Agricultural group	32.1	22.5	20.0	17.0	16.3	12.4	9.4
Oil group	10.4	17.4	18.8	19.8	27.8	40.8	50.6
Industry group	17.1	22.4	22.3	23.3	19.9	17.6	14.4
Services group	40.5	39.9	41.5	42.5	36.0	29.2	25.6
Net Factor Income from abroad	-0.1	-2.3	-2.6	-2.6			

[a]Sources: Bank Markazi Iran (12) (14).

try.[1] in 1972, at the beginning of the Fifth Development Plan in Iran, 40.1 per cent of labor force was employed in that sector, with only 30 and 29 per cent of the labor force employed in services and industry, respectively (83). The oil sector, the largest contributor to the economy did not absorb more than .5 per cent of the labor employed in Iran.

Agricultural Imports and Exports

The supply schedule of most agricultural products shifted to the right more slowly in the past 16 years than demand schedule which shifted rapidly. The result was a tremendous upward pressure on prices as quantity demanded generally exceeded the domestic quantity supplied at historical prices. Iran was a net exporter of most agricultural products before 1960. Part of the growth in demand was met through reducing exports and diversion of these quantities exported to domestic consumption. High population growth and rapid income growth meant quantity demanded at constant price far surpassed 2.9 per cent average annual agricultural output growth from 1961 to 1971.[2] In particular, during the 1970's, demand growth for agricultural products was about 10 per cent per year and much higher than in the 1960's, when domestic supply grew very little.

Consequently, imports of agricultural products and in particular food items increased in the 1970's. Except for cotton exports, all of

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[1]Although the number of agriculturally employed remained almost constant in absolute terms, around 3.8 million, the percentage of the labor force in agriculture declined considerably from 56 per cent in 1956 to 47 per cent in 1966.

[2]Other studies by FAO (30) and International Bank for Reconstruction and Development (42) disagreed with the above estimate given by the Centeral Bank of Iran and suggested a lower rate of growth, around 2.5 per cent for the agricultural sector, on the average, at fixed prices.

Consequently, imports of agricultural products and in particular food items increased in the 1970's. Except for cotton exports, all of the other groups products decreased simultaneously. Table 6 shows the value of imports, exports, net exports of agricultural products (livestock and farm products), and percentage of agricultural imports and exports to total imports and non-oil exports during the period of 1970-75.

Agricultural imports increased more than 10-fold from 13 billion rials to 135 billion rials ($191 million to $1.9 billion from 1970-75). On the average, agricultural imports (food and raw materials) constituted more than 15 per cent of the total imports. Iranian exports of agricultural products increased from 7.3 billion rls to 18 billion rls; 2.4 times in the same period. As a result of the higher demand, Iran's trade position changed from a net exporter of agricultural products to a net importer. Agricultural net exports fell from 1.5 billion rls in 1969 to a deficit of 80 billion in 1974, and 114 billion rls in 1975. The average of imports increased annually by 70 per cent whereas exports increased only by 32 per cent during 1970-75. Iran's major agricultural exports are cotton, dry fruits, skins and leather. Agricultural imports include cereal, sugar, vegetable oil, and livestock products (See Table 7).

Generally, the volume of agricultural exports is dependent on domestic demand, and as consumption increases more at home, there are fewer products available for exports. A good example of export dependency on domestic consumption was in the year 1973 when agricultural exports decreased more than 34 per cent, with a sharp parallel increase in consumption that year.

Table 6 also shows that Iran's agricultural share of imports

Table 6. Agricultural imports and exports (1969-75) - (in million rials)

year	Export	Import	Net Export	Agricultural exports as percentage of non-oil exports	Agricultural imports as percentage of total imports
1969	10,867	9,335	1,532	59	8.0
1970	7,363	13,378	-2,027	63	10.5
1971	12,773	20,385	-7,607	54	13.0
1972	16,578	24,755	-8,177	52	12.7
1973	27,002	40,732	-13,730	63	16.0
1974	18,001	97,943	-79,942	49	21.9
1975	21,714	135,642	-113,928	52	16.4

[a]Sources: Bank Markazi Iran (13) (14).

Table 7. Imports of major agricultural products (1970-75) (Thousand Tons)

	1970	1971	1972	1973	1974	1975
Wheat	22.6	993.4	771.3	784.8	1,433.1	1,439.6
Barley	0.1	191.9	23.1	107.5	178.5	203.9
Rice	5.6	60.5	91.9	11.7	191.4	282.9
Sugar	61.5	87.6	158.9	286.1	219.5	596.5
Tea	6.2	7.3	9.0	8.9	12.6	41.6
Vegetable Oil	117.3	104.9	142.9	110.5	226.7	231.2
Red Meat	15.4	6.8	7.6	12.6	24.2	53.8

[a]Sources: Bank Markzai Iran (13) (14).

has risen consistently in the last 5 years. On the other hand, the export share of the total non-oil exports fluctuated sharply from one year to another. The major factor of fluctuation is the amount of cotton exported, which has changed drastically from year to year, due to international price variations and the cotton production cycle in Iran.

Agricultural Investment

The lack of sufficient investment in the agricultural sector has probably been one of the major reasons for low rate of growth and productivity in comparison to other sectors of the economy. The concentration of low-income families in rural areas in most developing countries has certainly made it clear, that except for families with large land holdins, other farmers are not able to invest as much as required to produce the demanded agricultural products. Furthermore, land distribution among peasant families makes capital formation more difficult in this sector. Governmental price policies in most developing countries do not favor agricultural production, and that makes farmers even less eager to invest in the farm sector.

Price policy, in particular, can play an important role in production and investment in the agricultural sector. The deterioration of farm product prices in relation to other prices of non-agricultural products in favor of consumers in urban areas and the development of industrialization is a common policy in developing countries. Farmers' incentives for production and investment under these conditions will be hampered. It is very possible that capital will move to other sectors, where the rates of return or profit margins are higher than in the

agricultural sector.

The responsiveness of farmers to price incentives must be studied along with the general attitude of farmers toward what determines their decisions. Farmers are quick in response to cash crops price changes, but somehow are slower to price changes for subsistance crops. Fluctuations in production in response to price changes in Iran has been best observed with regard to the production of cotton, onions and potatoes. However, for permanent crops such as alfalfa, and livestock, production is slower in response, due to time-lag requirements.

In Iran, the combination of all these factors has contributed to the low level of investment in agriculture. Land reform in 1960-66, the low level of income in rural areas, and governmental policy toward keeping major farm product prices relatively constant while the prices of products in other sectors have been rising continuously has made the agricultural sector less attractive relative to other sectors of economy for investment.

During a period from 1965 to 1971, an average of 7.2 per cent of agricultural output was devoted to investment in terms of gross fixed capital formation. In this period, agricultural output at constant prices increased by 4.4 per cent (official report) per year. Therefore, for one unit increase in output in agriculture, only 1.6 units of investment were required. This capital-output ratio is surprisingly low. For the whole economy, the growth rate was 11.5 per cent, with an average gross domestic fixed capital formation of 23.3 per cent or an incremental capital-output ratio (ICOR) for the whole economy of 2.02, which is higher than for agriculture.

The ICOR for the U.K. in the agriculture sector and the whole economy are 5.4 and 5.7, respective from 1954-64 (5). The major differences between the amounts for two countries can be attributed to the role of oil income in the Iranian economy. This variance also confirms that the potential capacity of the Iranian economy to invest is far greater than for the U.K. and other developed countries.

Table 8. Incremental capital/output ratio of Iran's selected sector

Sectors	Investment Ratio[a]	Output rate of growth compound average annually	ICOR
Agriculture	7.3	4.4	1.6
Industries and Mines	16.4	13.8	1.2
Services	9.2	11.9	.8
The Whole Economy	23.3	11.5	2.02

[a]Investment in fixed assets as a percentage of the GNP.

Table 8 shows the investment ratio, average annual growth, and incremental capital/output ratio of Iran for the major sectors of the economy from 1964-71. The extraordinarily low (.8) and (1.2) ICORs for services and for industry are very interesting. There are two explanations for this phenomenon; one, that the rate of growth was overestimated, and therefore the ICOR must be raised to reflect the true economy. Second, since Iran is in the early stages of industrialization and urbanization and a small amount of investment can increase output more in

comparison with other countries, this is not very surprising in the early stages of development.

Fixed capital formation in agriculture remained relatively low compared to other sectors of economy. In 1970, only 12 billion rials or 6.5 per cent of the total fixed capital formation were in the agricultural sector. Even with more emphasis in recent years from the decision makers on the allocation of funds for the agricultural sector, agriculture's share in fixed capital formation did not exceed 8.9 per cent at fixed prices in 1974. On the other hand, industry's share in capital fixed formation at fixed prices was 20.3 and 22.7 per cent in 1973 and 1974 respectively, more than 2.5 times than that of agriculture.

There is no question that, in order to fill the vacuum which has been created by land reform, low income, and low incentives for investment as the results of price policy regulations in capital formation, public intervention is the foremost priority to accelerate development and growth in the agricultural sector. Developed and underdeveloped countries are both involved in policies which directly or indirectly require some kind of government investment in this sector. Research and development, subsidies for agricultural products, investment in the infrastructural development for dams, roads, electricity, and sets of regulations regarding tariffs, quota and trade agreements must be mentioned with regard to the increase of the productivity and income in the agricultural sector.

In Iran, government contribution has been in the form of development plans for disbursement in agriculture and water supplies. The lack of interest in the private sector for investment in the agricultural sector

has been partially compensated for by governmental policies, tax exemptions, low interest rates for long and short term credits, input subsidies such as fertilizer, improved seeds, machines, and direct investment have certainly been of value. However, in this regard, only 12.8 and 30.7 billion rials (7.9 per cent and 8.9 per cent) of the Fifth Development plan funds were spent on agriculture and natural resources projects in 1973 and 1974.[1] Moreover, the major portion of the funds was devoted to large and capital intensive agro-business complexes projects (2.4 billion and 5 billion rials in 1973 and 1974.).

On the average, only 7.8 per cent of the total credits of commercialized and specialized banks were devoted to private sectors for agricultural purposes. Two agricultural specialized banks (government affiliated) account for 75 per cent of the total credits given to private sectors. Table 11 shows that commercial credits to the agricultural sector expanded rapidly, indicating more commercialization of agriculture sector in recent years. The wider use of credits represents a change of attitude from the subsistance-agricultural type of production toward more science-based technological agriculture. Although there is a shortage of credits in most parts of the country, in particular small units and villages far from cities, the small farmers still rely heavily on local people for loans at high interest rates.

The Fifth Development Plan projected a 7 per cent growth rate in the agricultural sector, which in comparison with past trends and the performance of other countries' agricultural sector is relatively high (see

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[1] In the first two years of the Fifth Development Plan, only 11.7 per cent of anticipated agricultural sector expenditure by government was utilized.

Table 12). Investment in the agriculture sector has increased by more than 510 per cent with respect to the Fourth Development Plan.[1] But this amount represents only 6.6 per cent of total projected investment in the Fifth Plan. In particular, major attention has been paid to large agro-industry complexes and large projects as the fastest way to increase production. A major portion of investment will be in livestock complexes to provide highly-demanded meat and dairy products.

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[1] In the Fourth Development Plan (1968-72) only 65 billion rials or 13 per cent of the total projected revenues were devoted to the agriculture sector.

Table 9. Distribution of fixed investment in the Fifth Development Plan (1972-77) (billion rials)

	Amounts	Percentage of total	Expected growth rate
Industry and Minings	846.4	18.0	18
Agriculture and natural resources	309.3	6.6	7
Transportation and communication	492.2	10.5	
Housing	925.0	19.7	
Oil and gas	791.2	16.8	
Others	1,334.7	28.4	
Total	4,698.8	100.0	
Sources of Investment			
From public funds	3,298.2	70.2	
From private funds	1,400.0	29.8	
Total	4,698.2	100.0	

[a]Source: Bank Markazi Iran (12).

Table 10. Agricultural growth rates during 1960-1974

Items \ Average growth rate	1959-61	1962-66	1967-71	1972-74	1960-71	1959-74
At current prices	4.3	5.8	7.6	21.0	6.4	9.6
At fixed prices	1.3	4.6	2.9	6.9	3.5	3.9

[a]Sources: Bank Markazi Iran (12).

Table 11. Credits to agriculture sector by banks (billion rials)

	1970	1971	1972	1973	1974	1975
Commercial Banks	9.5	4.0	4.1	4.7	9.4	18.2
Agricultural Cooperative Bank of Iran	8.9	13.4	24.8	29.8	44.9	52.4
Agricultural Development Bank of Iran	---	---	---	2.8	8.3	23.4
Total Credits	18.4	17.4	28.9	37.3	62.6	94.0

[a]Sources: Bank Markazi Iran (11) (14).

CHAPTER IV. ECONOMY OF LIVESTOCK INDUSTRY IN IRAN

Animal husbandry constitutes approximately 30 per cent of value added in the agricultural sector of Iran as estimated by the Centeral Bank of Iran in the early 1960's.[1] The livestock sector grew at half the rate of that of the agricultural sector, or 2.1 per cent at fixed prices during the 1960's (12). Other estimates gave even a lower growth rate for livestock during the same period (43). However, during 1970-74, the average for livestock growth was reported at 7.2 per cent at fixed prices and 16.3 per cent at current prices (13).

Livestock production is the main economic activity for nomads, constituting a major source of their income. For village farmers, livestock supplements their farming activities and contributes a major portion of their income. Livestock by-products such as milk and wool are essential for nutrition and the carpet industry in villages. Wool production from sheep and hair production from goats were 35 and 8.7 thousand tons in 1974. One major source of heating energy is animal waste which is gradually being substituted for oil and other sources of energy.

Ownership of Livestock

The ownership of livestock is distributed widely among villagers.

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[1]The ILO (43) and LeBaron estimates (50) for the share of livestock in the agriculture sector are higher than the estimation given by the Centeral Bank of Iran. The ILO estimate for livestock's share in agriculture in value added was around 50 per cent for 1971.

Of 2.9 million establishments,[1] 55 per cent of them have sheep or goats and 52 per cent have cattle or buffalo. Only 7 per cent of the villagers have no land or cows, and only 3.8 per cent have no sheep or land. Based on the agricultural census of 1971, the landless villagers constitued 13.7 per cent of the establishments (80).

The size of livestock ownership is small. On the average, livestock owners have 3.6 cows, 15.6 sheep and 8.3 goats. Livestock ownership has a direct relationship with the size of land, with large land holders also having a larger herd of livestock. As Table 12 shows, the major portion of livestock in the category of sheep and goats over 51 head and cattle over 21 head belongs to owners which hold between 10-50 hectares of land. Conversely, 63 per cent of sheep and goat owners have no land or own less than 2 hectares. The similar figure for cattle owners is 42 per cent.

There is no data on the number of animals distributed among villagers based on land and number of flocks. But from the distribution of livestock among farming units, one can understand how livestock distribution in Iran is dispersed. Among livestock owners, 81 per cent have 1-4 cows and 61 per cent of them have fewer than 15 head of sheep and goats (see Table 12).

Per family ownership of animals is somewhat larger in tribes than in villages. The size of ownership ranges from 50 to thousands of head. Animal husbandry is the major source of income in nomadic economic activity. As a major source of income, larger herds are required to support families. However, there is no data on the size of family

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[1]Commercial establishments excluded in agricultural census.

animals holding among nomadic tribes.[1]

Evidence from developed countries has shown a change to larger size of land and animal holdings. This is structural change and cannot be accomplished in a short time.[2] Perhaps one factor which has contributed to the continuance of small size livestock ownership is the collective utilization of rangeland. Under this system, everybody grazes as many sheep and goats as he wishes on ranges which belong to the public. Each flock of around 250 sheep and goats could have as many as 40 owners, whose only cost in most seasons is for shepherds' wages, based on the number of animals each one owns.

Each owner has exclusive rights on sheep products, culling time, and amounts of feeds which he wants fed to animals as supplements. Therefore, there is no harmony in flock composition in villages. The composition of flocks varies widely within even one area, making almost impossible the achievement of optimum size and composition of flocks. Many researchers were surprised by the high ratio of male animals and the older age of sheep and goats in flocks which is not economically justifiable. However, they seem to forget to take into consideration the effect of institutional factors on the economic phenomena.[3]

Optimum size and composition of flocks can be defined as the size

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[1] In a study of Shahsavan tribes, the average ownership of sheep per family is estimated at 131 head. In addition, each family has a few goats, a donkey, and a horse (38).

[2] Lack of mobility of farmers, uncertainty about job availability in other sectors of the economy, and preference for living in the village rather than town has kept the number of population in the rural area constant.

[3] For more discussion in this subject see Marketing of Livestock.

Table 12. Livestock ownership distribution in Iran (1972)

Distribution of establishment based on land	Based on Sheep and goats number					Based on cattle and buffalo number				
	1-5	6-15	1-15	16-50	51 and over	1-4	5-10	1-10	11-20	21 and over
Total with and without land (livestock owners)	22.5	38.6	61.3	30.8	8	81.3	16.6	97.9	1.6	.6
Without land	15.4	38.5	53.9	16.3	17	13.6	10.0	23.6	17.4	12.5
Less than one hectare	33.7	18.7	52.4	10.6	10	18.8	6.6	25.3	8.7	25.0
1-2 hectare	11.0	7.5	18.5	7.2	4.6	12.9	8.5	21.4	4.3	12.5
2-5 hectare	17.6	17.4	35.0	18.5	13.9	21.7	22.2	43.9	13.0	12.5
5-10 hectare	14.0	20.3	34.3	20.9	18.6	18.1	23.4	41.8	13.0	---
10-50 hectare	8.0	14.8	22.8	26.0	31.7	14.7	28.9	43.6	39.1	25.0
50-100 hectare	0.0	0.0	0.0	.2	2.3	.1	.4	.5	4.3	---
100 and over	0.0	0.0	0.0	0.0	1.5	0.0	.4	.4	0.0	---

[a]Source: Agricultural Census 1350 (80).

manageable from predators under shepherd management and the composition such that maximum meat and milk production can be achieved with the least feed consumption per unit of meat production. Flock size varies from 100 to sometimes 500 under the supervision of one or more shepherds.

Institutional factors involved in livestock husbandry are ownership of stocks, utilization of pasture and ranges, and attitudes of villagers towards the prestige and pride of livestock ownership. Some of these factors are not necessarily consistent with profit maximization or optimum production.

Population of Livestock in Iran

The number of livestock in Iran is not known and most statistics on livestock population are guesswork. Official data on the number of livestock vary from one organization to another and are overestimated or underestimated by millions. One major problem in this regard is the migration of livestock from place to place, so that time of the survey can make a difference by millions of heads.

There is no reliable time series data for livestock numbers although there are indications that livestock population has increased substantially in the last 20 years (20). Table 13 shows the livestock numbers estimates from 1960 to 1974 estimated by FAO (31). Sheep and goats are two major types of livestock in Iran whose numbers fluctuated upward in this period.

IBRD (42) population figures are surprisingly higher than are those of other estimates. The poultry population figure can be explained as a result of rapid expansion in commercial production, but the numbers of

Table 13. Livestock population in Iran

	1000 Head						
	Cattle	Buffalo	Camel	Sheep	Goat	Chicken	Duck
1961-65	5459	309	234	24,400	16,060	24,900	128
1970	5200	412	120	35,000	15,200	29,700	142
1971	5300	423	115	35,500	15,000	20,500	143
1972	5516	434	110	36,000	14,700	31,000	143
1973	5640	447	111	37,000	14,700	32,000	143
1974	5760	460	111	38,000	14,600	35,000	143

[a]Source: FAO Production Yearbook (31).

goats and cattle cannot be so simply justified. It has further been indicated that this estimate is based on the December inventory, which is lower than that of other months (before lambing). Since most estimates are based on off-take percentage assumptions, a percentage of slaughtered animals to total population, any small change in the assumed rate could make substantial differences in population estimates. For cattle, the off-take percentage was estimated at 19.5 per cent in 1974 which is lower than the industrial countries. This is an indication that cattle husbandry in Iran is not for meat production as it is the case in the other countries. Since the introduction of machinery in Iranian agriculture, the number of draft animals has decreased, as they have been slaughtered for meat production. Hence, the slaughter rate for cattle increased extraordinarily rapidly in recent years. Therefore, the number of cattle must be estimated downward to take into account of this event.

Climatic and topological farms of Iranian land vary from one area to another. Mountains and valleys (major source of feed) are much more suitable for sheep and goat husbandry than for other animals. Range is the main source of feed in Iran; some estimates indicate up to 70 per cent of feed coming from the range production. Since feed costs constitute up to 80 per cent of the total costs of livestock, range significance has become more known from an economic point of view.[1] The nomadic tribes' dependency on range land has been long recognized. Geographically, they divided the ranges in such a way that the right of

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[1]Feed costs vary among classes of livestock. In dairy, sheep and cattle fattening, the feed costs on the average constitute 94, 85, and 90 per cent of the total costs excluding fixed cost in Iran.

each tribe on each range is well-known to the others and, since the animals they graze are the only sources of their livelihood, they keep the ranges fit for grazing. The range capacity was under the full utilization until 1960, but as they grew, urbanization and income growth caused demand for meat to increase rapidly, and the numbers of livestock also increased. Cultivation of more lands which had been used for grazing of livestock for nomads and an increase in village sheep holdings have limited the range area for nomadic livestock grazing.[1] The feeding of animals is not an ordinary practice for nomads and under severe winter conditions or drought, they have lost many animals as a result of starvation. Migration from one place to another in search for feed for animals and characteristics of Iranian sheep (with fat tails) through natural selections for many years have made this type of animal husbandry possible in Iran.

As the numbers of sheep and goats have increased and the amounts of range area have been reduced, pressures have increased on the remaining range land by overgrazing of animals and hence the depletion of the range commenced with the present circumstances. Different studies concluded that overgrazing by animals is 3 to 6 times more than the range capacity. In addition to sheep, goats, and cattle, there are horses, camels and donkeys used mainly for transportation in villages which are also utilizing some of these feed resources.

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[1] One has to differentiate between nomads which are not settled in any land and transhument who have migratory flocks seasonally. Based on seasonal (or monthly) migration, 80 per cent of Iranian flocks are considered migratory.

Goats contribute substantially to meat and milk production in Iran. Goat milk production, in particular, is more important than sheep as a source of nutrition for rural society.[1] Another advantage of goats is that they have greater resistance in times of feed and water scarcity and can graze in high mountainous places where sheep cannot reach.

Meat Per Capita Consumption

Meat consumption in Iran has not contributed to daily protein requirements as much as it has in other countries. The low level of meat consumption (16.9 kg annually) is compensated for by high levels of cereal consumption, in particular wheat, which constitutes a major portion of the Iranian diet.[2] Low caloric consumption per capita or protein deficiency in Iran is not a result of low meat consumption, but possibly a result of general undernourishment. Animal protein constitutes 2.2 per cent of the total daily protein consumption which in 1970 was estimated at 57.7 grams per day.[3]

Red meat consumption in Iran mainly consists of sheep and goat meat (70 per cent), while beef and veal constitute around 30 per cent. Camel meat and pork consumption is 1.2 per cent of the total meat con-

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[1]Goats produce .25 kg milk per day, where sheep produce .15 kg milk per day during the lactation period.

[2]Per capita human consumption of wheat in Iran is around 150 kg which is among the highest rates in the world.

[3]FAO has estimated the required daily calorie and protein at 2,322 and 60 grams, of which 20 grams must be animal protein.

sumption in Iran. Poultry consumption has increased drastically in recent years, and its per capita consumption increased from 1.8 kg to 3.0 kg from 1968 to 1975.

Table 14 shows the per capita consumption of red meat and poultry in Iran during 1961-75. Most studies agree that per capita consumption of red meat in Iran has slightly decreased or stayed the same (43) (50) (26). However, due to inadequate data on meat production, some official data suggest a slight increase in per capita consumption during 1970-74. Even with high estimates of red meat and poultry consumption in Iran as 13.9 kg and 3 kg respectively, Iran's per capita consumption is much lower than that for most developed countries. European red meat per capita consumption is around 70 kg, while consumption in the United States is over 100 kg which amounts to 6 to 10 times more than those consumed in Iran.

Poultry meat consumption on the other hand, is growing faster than any other meat in Iran. High income demand elasticities and also supply for poultry availability in the market, more than other meats, has increased the per capita consumption in Iran. However, there are cultural, traditional, and cooking style habitual which make red meat consumption unique in Iranian diet.[1] IBRD (42) estimation of meat per capita consumption in rural and urban areas, shows the consumption of mutton, beef, and poultry per capita in urban areas, were at 300.60 and 254 per cent more than rural areas in 1968. The wide gap between per capita meat consumption in rural and urban Iran and between Iran and other developed countries makes

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[1]Fish consumption in Iran is very low (.4 kg) per capita, and mainly is consumed in coastal areas.

Table 14. Production, trade and consumption of red meat and poultry in Iran

Year	Production in tons	Imports in tons	Exports in tons	Consumption in tons	Consumption per capita in kg.	Poultry[b] production in tons	Per capita poultry in kg
1961	256,816	753	2,495	255,074	11.9		
1962	260,928	327	2,415	258,840	11.8		
1963	249,786	236	3,241	246,781	11.0		
1964	250,972	533	5,093	246,412	10.7		
1965	273,300	340	8,044	265,596	11.2		
1966	264,835	154	13	253,510	10.1		.8[c]
1967	271,086	1,154	5,352	273,870	10.6		
1968	277,348	1,223	3	278,560	10.2	48.5	1.8
1969	272,000	10,200	0	302,200	10.7		
1970	335,000	15,472	1,309	350,472	11.9	50,000	1.7
1971	380,000	6,800	3,189	383,611	12.7	60,000	2.0
1972	437,000	7,600	1,364	443,236	14.3	71,000	2.3
1973	450,000	12,600	1,832	460,768	14.5	82,000	2.6
1974	432,000	24,200	533	455,667	13.9	98,000	3.0
1975[d]	514,000	53,800	---	567,800	16.4	115,000	3.3

[a]Sources: Report by the agricultural team of plan organization, 1966, Iran statistical yearbook, Centeral Bank of Iran annual report 1974 (13).

[b]Poultry production almost equivalent with poultry consumption.

[c]FAO estimate.

[d]Meat production estimated by Centeral Bank also includes slaughtered imported live animals.

Table 15. Projections of urban and rural consumption in Iran for selected years to 1985

Year	1968		1975		1980		1985	
Commodity	thousand tons	kgs/ cap.	thousand tons	kgs/ cap.	thousand tons	kgs/ cap.	thousand tons	kgs/ cap.
Mutton								
Urban	171.3	15.9	263.1	17.6	341.6	18.8	439.1	20.0
Rural	87.8	5.3	120.2	6.4	148.0	7.2	179.5	8.0
TOTAL	259.1	9.5	383.3	11.3	489.6	12.6	618.6	13.9
Beef								
Urban	34.3	3.2	57.6	3.9	78.6	4.3	105.7	4.8
Rural	43.2	2.0	58.7	3.1	71.8	3.5	86.7	3.9
TOTAL	77.5	2.8	116.3	3.4	150.4	3.9	192.4	4.3
Poultry								
Urban	30.3	2.8	58.2	3.9	84.6	4.7	119.5	5.4
Rural	18.2	1.1	27.5	1.5	35.4	1.7	44.5	2.0
TOTAL	48.5	1.8	85.7	2.6	120.0	3.1	164.0	3.7

[a]Source: IBRD Report, 1970 (42).

Table 16. Per capita meat consumption in urban and rural areas (in kg)

Year	Rural Area			Urban Area		
	Mutton and Goat	Beef	Poultry	Mutton and Goat	Beef	Poultry
1963[b]	8.2	2.2	1.9	----	----	----
1964	6.6	1.9	.7	----	----	----
1965	6.5	2.1	1.3	15.1	5.2	2.1
1966	5.3	2.6	1.1	15.6	3.1	2.4
1967	8.3	2.7	8.0[c]	15.8	3.5	2.5
1968	7.3	2.4	2.3	15.9	3.2	2.8

[a]Estimates are based on family budget survey.

[b]There are no similar figures for 1963 and 1962 in urban areas, however, per capita consumption in 1959 for urban areas are 19.0, 3.1 and 2.5 kg for mutton, beef and poultry respectively.

[c]The figure given for poultry per capita consumption is extraordinarily large, one reason stated is widespread epidemics among poultry in that year caused many farmers to slaughter their chickens.

it clear that there is tremendous potential and interest in meat consumption in Iran.

In general, with the rapid increase in income and the low level of meat consumption, Iran's demand for meat has a potential growth of more than 10 per cent, but production limitation and limited imports would force prices up and with fixed prices, periodic shortages of meat become more frequent.

In addition to meat, dairy product consumption has also increased continuously. Demand for all dairy products reached the point where domestic production, in spite of the high growth rates (7.5 and 7 in 1973 and 1974) was not sufficient. Imports of dairy products and eggs in the last two years increased an average of 77 per cent annually.

Livestock Imports and Exports

Traditionally Iran was a net exporter of livestock until 1967, when imports surpassed exports. Two neighboring countries, Afghanistan and Turkey were the main suppliers to Iran of livestock, mainly sheep. Iran's major sheep markets were Persian Gulf Emirates. Iran was importing sheep from Eastern and Western borders and exporting from the southern ports at the same time. In many cases flocks of sheep passed through the borders without any records or traces of transactions being reported (89).

Government intervention through the meat organization by direct imports has changed the direction of trade. Cheap frozen meat and live animals have been imported from New Zealand, Argentina and Australia in large amounts. Also, fresh and high quality meat is imported by

refrigerator trucks from Eastern Europe. The consumers' preference for fresh meat and fat tail mutton has restricted the amounts and type of imports to some extent. For example, butchers in Tehran were forced to accept a portion of their meat frozen. But customers' restraints caused the butchers to decrease prices of frozen meat and increase the prices of fresh meat unofficially. However, the Meat Organizations were selling all the meat in the same prices.

Table 18 shows Iranian imports of meat based on Meat Organization reports. There is a major discrepancy between the Centeral Bank report on red meat import and that of the Meat Organization. Live animals imported via borders without official reports are not included in the Centeral Bank report. Therefore, for example, in 1974 the Bank's report of red meat import was 24.2 thousand tons, whereas, the Meat Organization's report is 63 thousand tons, a significant 40 thousand tons discrepancy.[1] The imported live animals are thus considered as domestic production and therefore domestic production must be re-adjusted downward by 40 thousand tons. Imports of livestock products (including meat) have increased persistently, where exports have fluctuated up and down. During 1973-74 exports of livestock products due to higher domestic consumption decreased substantially. It reached to 795 million rials in 1974 from the record 2927 million rials in 1972.

From a net exporter of livestock products at 715 million rials in 1961, Iran's imports have increased faster than exports and net imports

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[1] ARDAM (2) estimate of meat imports is 20 thousand tons, higher than the above figure in 1974.

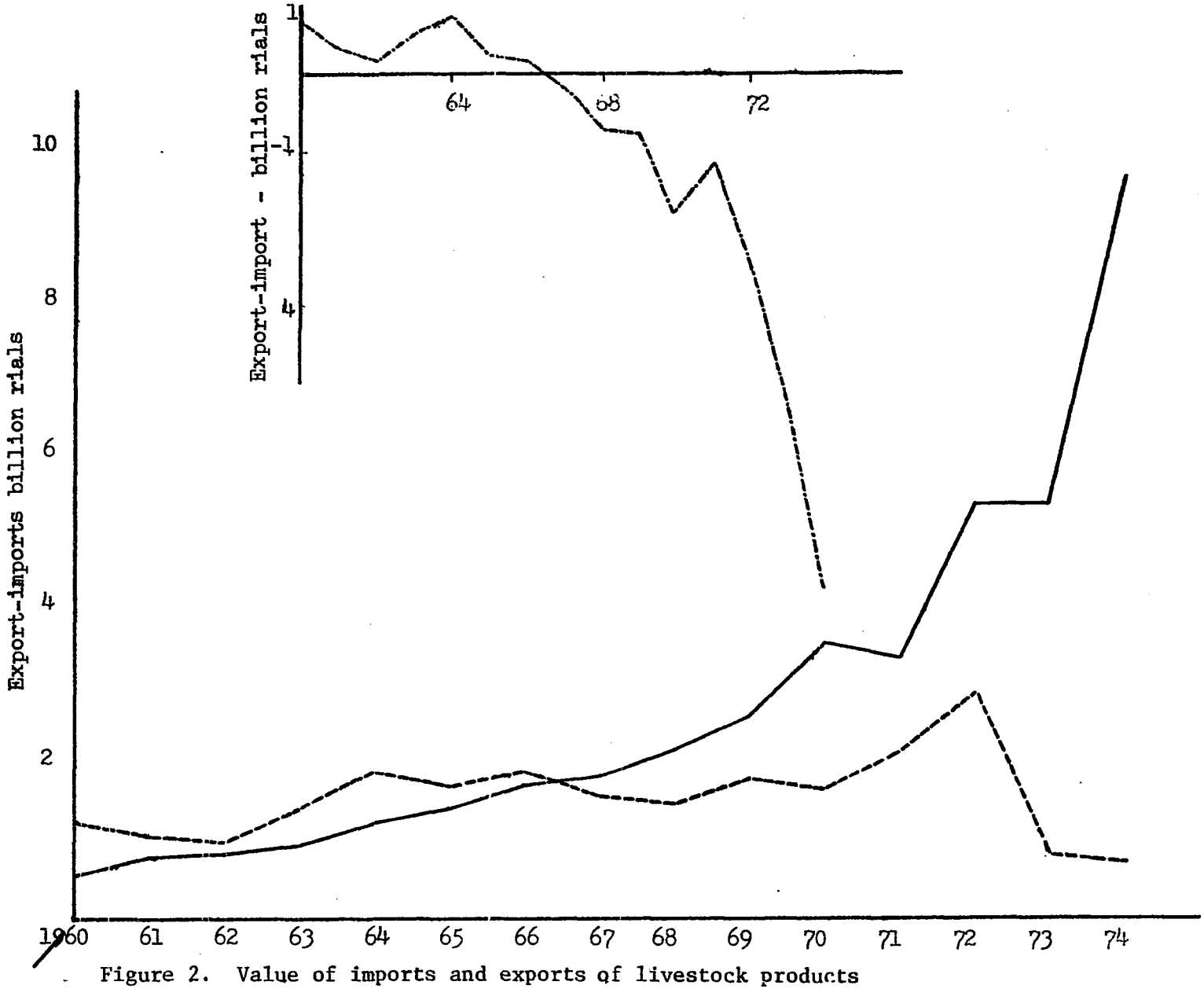

Figure 2. Value of imports and exports of livestock products

reached to around 9 billion rials in 1974. Table 17 and Figure 2 show the imports, exports, and net imports during 1960-74.

Employment in Livestock Sector

Animal husbandry and farming activities are not associated activities in most parts of Iran. Farmers are also involved in livestock production activities and in most cases livestock income is a supplement to their income. Based on the year 1972, in the agricultural census, 55 and 52 per cent of farms were involved in sheep and goat and cattle husbandry respectively. The ownership of cattle does not necessarily imply that they are producing meat or milk. A major portion of the bulls owned are used as draft animals, and meat production is considered as a by-product.

Based on the Plan and Budget Organization estimations in 1966, 20 per cent of the labor force or 15 per cent of the population were in livestock husbandry (83). Including nomads, 4.5 million or 28 per cent of the population is involved in livestock activities and related activities. This constituted around 40 per cent of the agricultural labor force in 1966. However, these percentages consist of both part-time and full-time employees in this sector.

Nomads are completely involved in livestock raising, and up to 70 per cent of their source of income comes from livestock production. The number of nomads is not known clearly. The Bureau of Tribal Development in 1970 estimated that the population of tribes settled and unsettled is approximately 20 to 25 per cent and unsettled are around 8 per cent of the total population (56). This estimation is equivalent to 2 million nomads (unsettled).[1]

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[1] FMC reported 1.6 million nomadic tribesmen in 1974(32).

Table 17. Export and import of livestock products (million rials)

Year	Export (x)	Import (m)	Net Import (x-m)
1961	1251	536	715
1961	1111	779	332
1962	1027	874	153
1963	1465	974	491
1964	1934	1228	715
1965	1764	1474	290
1966	1911	1735	176
1967	1613	1884	-271
1968	1513	2202	-689
1969	1858	2641	-783
1970	1713	3561	-1848
1971	2227	3437	-1210
1972	2927	5422	-2495
1973	890	5233	-4343
1974	795	9710	-8915

[a]Sources: Bank Markazi Iran, annual report 1349, Foreign Trade Statistics of Iran (13) (33).

Table 18. Imports of sheep and meat (fresh and frozen) by Meat Organization (carcass weight ton)

Type of Meat	1969		1970		1971		1972		1973		1974	
	Head	Weight	Head	Weight	Head	Weight	Head	Weight	Head	Weight	Head	Weight
Fresh Meat (chilled)	368,500	5,896	154,000	2,772	140,500	2,811	70,288	1,455	170,794	3,623	313,717	5,582
Frozen	238,467	4,650	506,196	10,428	261,836	4,380	352,608	7,056	780,309	14,386	1,632,136	25,437
Live Animals[a]	179,950	3,815	434,465	2,392	367,991	8,499	413,518	8,684	677,390	14,225	1,543,884	32,422
Total[b]	786,551	14,361	1,094,661	22,662	770,367	15,690	836,424	17,194	1,628,493	32,234	3,489,737	63,441

[a]Estimated based on per head sheep.

[b]In addition, 3,216 tons of beef and 6 thousand poultry were imported by Meat Organization in 1974.

On the other hand, the 1966 census report gave only 750 thousand or 2.8 per cent of the total population as nomadic. There is no other available data in this regard, but there are some indications of underestimation by the population census data. However, after the nationalization of forests and ranges, many nomads have settled down and started farming as a first job. Therefore, at the present with regard to all information, the nomadic population is estimated at around 1 million.

In addition to nomads and farmers with livestock, there are other groups of people who directly or indirectly are part-time or full-time employed in the livestock sector, which includes those farmers who prepare feed for animals.

There is no evidence of unemployment or underemployment among the nomad tribes. A study on the Shahsaven tribe stated that there are no unemployed nomads in this tribe. There is, however, seasonal unemployment in December and January, but there is also a need for more than 18 thousand hired labor during spring and early summer.

Since livestock production is a year round job, while farming changes seasonally, one alternative to cope with seasonal unemployment is the development of livestock activity in order to utilize the labor surplus during high seasonal unemployment. The introduction of cottage industries in villages in order to use livestock products would reduce seasonal unemployment. A good example of this type of industry is carpet and other kinds of products from wool which have contributed to generate income of villagers and tribes and employed a substantial portion of the underemployed labor force in rural areas.

Marketing of Livestock in Iran

In studies of livestock economy in Iran, marketing problems have been recognized by many investigators. Marketing is defined as "the performance of all business activities involved in the flow of goods and services from the point of initial agricultural production until they are in the hands of the ultimate consumer" (100). This definition includes all the processes of transactions from production to consumption of goods, including livestock marketing, wholesaling, transportation, slaughtering, processing and retailing. The marketing system is a very important part of the livestock industry and a careful study of the system in Iran is needed. In the United States, from the total retail share value of meat sold to consumers, 52 per cent or 8.6 billion dollars in 1962 went for marketing (100).

Producers of livestock in Iran, as mentioned above are nomad tribes or villagers who are chiefly small holders. Livestock owners are reluctant to sell their stock in spring or winter due to lambing, and months when there is abundant feed available in ranges and pastures. August or the beginning of fall is the best possible time for the selling of livestock in Iran, when crops in pastures and ranges become less suitable for feeding of livestock.

In an interview by the author with livestock producers in villages, in answer to the question of when they will sell their livestocks, few owners mentioned market prices, time, or reaching a certain level of weight as reasons for selling their animals at a specific period of time. Most livestock owners indicated other reasons, such as, a lack of feed, financial need, lack of place to keep animals, and age of

animals (too old) as the most significant reasons for selling animals.

Therefore, the sale of animals in Iran is not done for the same reasons as in other countries. As a cash crop, producers have the opportunity to sell their livestock whenever they decide. But they keep animals for insurance in case of financial need, and they see no reason to sell their sheep or goats as long as the feed cost is zero or minor. The cost of a shepherd was not a burden to owners due to cheap labor availability until recently. But wage increases in the last two years have caused more concern about livestock numbers to keep.

In Iran, each city has its own livestock yard or "meidan" for the sale of animals by producers. Livestock is usually brought from the vicinity of cities to market, but sometimes price differentiation or low demand in local markets makes it profitable to transport animals from a long distance to a particular market. In Tehran, it is very common to find animals from such provinces as Khorasan, Azarbaiejan and Fars, from distances up to 1000 km.

Transportation is mostly by truck, or railroads from long distances or trailing the sheep or goats in close distances, or some part of the way. Transportation costs are approximately based on head per km and are different for cattle, sheep and buffalo. Trucks hauling lambs are double-decked and carry up to 160 sheep at once. The costs per head for sheep from Meshed to Tehran, 900 km, range from 100 to 150 rials per head, depending on the availability of trucks.

The role of the middleman or "chobdar" in marketing is very important. In tribes and villages, each person has only a few animals and is not willing to sell more than one or two at once. The "chobdar's"

role is to travel to villages and tribes in search of animals ready to go to market. Each "chobdar" goes to a certain area where people know him well and pay cash for sheep and goats. He might have to go to many villages in one area to find enough sheep, gather them in one place, and then bring trucks to carry them to market. It is also possible in some places that sheep owners in one village decide to put together their marketable animals and assign a person to represent them, and transport the sheep and goats to market and sell them directly. But this could happen once or twice a year, and it is not very common.

Sheep and goats are sold per head or "two by two." Animals might be weighed live, but usually "chobdars" are skillful in estimating their weight by lifting them. Although they pay per head, they actually pay based on their estimates of the animals' weight (fatness or leaness).

Most middlemen regularly visit a specific area, and are known to livestock owners. The purchasing of livestock is not monopolized by one "chobdar," and there is some competition among other buyers. Hence, they cannot purchase animals from producers at very cheap prices and sell at much higher prices in the market. The difference between buying and selling prices varies, but usually it ranges from 10 to 20 per cent, and "chobdars" are responsible for transportation costs, loss or risk involved during transactions. In remote villages, it is possible to purchase livestock at cheaper prices, since access to information is limited and only a few chobdars visit the villages.

In meidan all animals which are brought from many places the night before or in early morning are for sale. Except for Friday, and some holidays, on other days of the week buyers and sellers are in the market

for transactions which will last until noon at the latest. The remainder or late arrivals stay in nearby places until the next morning. This has an additional cost for livestock sellers. They have to pay 10 rials per day for each head. They must buy their feed from that place at higher prices which are much higher than on the outside market. Therefore, there is an urgency to sell animals as soon as possible on the same day.

Until 1969 the "Tehran Mutton Supply and Distribution Syndicate" and "Tehran Beef and Veal Syndicate" were responsible for buying animals and distributing the meat among butchers. They were authorized by Tehran municipal as a sole distributor in Tehran. Beef and sheep stores are separate, and each butcher had a share in the syndicate and based on their share he would receive a "quota." The syndicate purchased sheep, goats, and cattle in the early morning of each day until there were no sheep or cattle or until the syndicate decided arbitrarily to stop buying. In fact, they were the sole buyers and no butchers could buy live animals or meat from anyone else except the syndicate. If butchers happened to buy meat from non-syndicate sellers, it was considered smuggling or an unauthorized transaction. The meat was then confiscated, meat buyers were heavily fined by municipal inspectors and in some cases the syndicate cut the butcher's quota. The syndicate purchased on a basis of dressed carcass weight. The prices paid to sellers of livestock included payment for hids, offals, and skins as part of the payment calculated for dressed carcass weight.

In other cities, butchers are directly involved in buying animals from sellers, and prices vary based on the availability of animals in

the market. During the syndicate operation in Tehran, there was a rumor that some of the syndicate bosses "indirectly" intervened in the market by buying through some of their agents known as "Dallal" at deliberately cheap prices determined by them. Then they sold the animals the next day at higher prices which again had been determined by the syndicate. Through this type of operation, by causing prices to fluctuate deliberately, the syndicate bosses made tremendous fortunes and placed producers in a helpless situation.

In 1972, municipal authority to dissolve the syndicate and Meat Organization, a government agency, was established in order to take over the meat distribution from the mutton syndicate in Tehran. In addition to Tehran, in Isfahan, the second largest city, meat is distributed by the Meat Organization. The Meat Organization (MO), in addition to buying indigenous sheep, is involved in the import of live animals, fresh and frozen meat, and the fattening of imported or domestic sheep for distribution of meat in these two cities. In order to stabilize meat prices, and keep retail prices low, the government makes subsidies through the MO.

Slaughterhouses in cities are supervised by municipal authorities and usually are adjacent to livestock trade markets. The only modern slaughterhouse in Iran is in Tehran and is now operating over capacity. There is no packing center in the slaughterhouse and meat is distributed dressed.

Chart 1 illustrates the livestock-marketing relationship in Iran. Although there are major differences between the Tehran livestock market and those of other cities (Meat Organization intervention), nevertheless,

the chart indicates all types of transaction relationships in different markets. There are some middlemen known as "Dallal" in the livestock market, who buy and sell livestock in the market or act as arbitrators between buyers and sellers, making some money without serving any function or purpose.[1] Some commercial beef producers are now by-passing the "Tehran Beef Syndicate" and are directly selling their meat to big supermarkets in Tehran and therefore reducing marketing costs. This has been authorized by the Minister of Agriculture in order to encourage high quality beef production for which there is a demand in restaurants and high income families in Tehran. They can charge buyers a higher price than the beef syndicate.

Wholesale and Retail Marketing and Prices

Until 1972 the Guild Chamber and the municipality of Tehran and other cities was responsible for regulating retail meat prices. During 1972-73 the Ministry of Cooperatives and Rural Affairs was in charge of regulating the meat prices. Since then, the Meat Organization in Tehran and Isfahan has been distributing mutton and fixing retail and wholesale prices. In other cities, the wholesale prices have been determined mainly through market and municipal authorities, who fix retail prices with the participation of butcher representatives for a period of time which is usually adjusted by seasonal supply and demand fluctuations. There is no organization for poultry distribution in Tehran or other

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[1] Dallals are familiar with the livestock market operation and always have cash in hand in order to purchase livestock cheap from producers, who they are not familiar with the market or they don't want to stay longer in the market.

cities, but during the policy implication or price control, the Guild Chamber or municipal authorities set a specific price for wholesale poultry meat and retail poultry production.

The retail prices are officially fixed and controlled although demand pressure and severe meat shortages have caused violations by butchers. In general, demand for high quality meat is met by higher prices paid by consumers. Since there is no grading system (except for four categories of meat), violations of official prices are very frequently committed by butchers. Also, there are more violations in higher income ports of cities (north or suburbs of the cities) in comparison with lower income ports of cities (southern ports of the cities). One common practice among butchers with more than one shop is to transfer high quality meat from their southern shop to their northern shop, where, there is a high demand for it.

The tastes and preference of consumers have been for mutton and goat from younger animals, veal and beef next in line. Camel meat in some areas is regarded as a last resort; however, the number of slaughtered camels has increased in recent years, mainly due to the scarcity of other types of meat. Goat meat and mutton substitute easily for each other, but beef substitutability is found to a lesser extent.

Tables 19 and 20 show the retail and wholesale price indices of meat prices in the last 16 years. The indices of wholesale and retail prices indicate a sharp increase in retail and wholesale meat prices in recent years. Tables 19 and 20 and Figures 3 and 4 also illustrate a widening gap between wholesale and retail margin price index for mutton and

goat. In spite of price controls and government subsidies for mutton, black market prices are much higher than fixed prices, and therefore the profit margin of mutton retailers has increased in recent years without any inducement effect on producers. On the other hand, in the beef market in which the government has not intervened, the profit margin has been narrowed in favor of producers. From an economic point of view, high prices would induce producers, on the one hand, and discourage the consumers on the other hand. Therefore, the gap between wholeslae and retail prices makes for less efficient price changes and the producer could not benefit from higher prices.

Black market prices for meat which exist everywhere despite supervision by authorities are high -- as much as 80 per cent over official prices. High prices may also be attributed to the lack of reflection of tastes and preference of consumers in the official price determination. The preference of consumers for fresh meat to frozen meat is not reflected on meat prices which are officially determined. The Meat Organization was selling frozen and fresh meat at 70 and 72 rials during 1972-74 and at 72 and 80 rials in 1975. The small differentiation between prices does not reflect consumers' preference, and in practice butchers arbitrarily reduced the frozen meat prices as much as 50 rials and increased the fresh meat prices to some extent in order to sell their meat (25).

Meat grading is not practiced in Iran. Only two major categories of meat exist: meat with bone, and meat without bone. Also, carcass meat is divided into four main divisions, with the price of each part officially fixed by the authorities. There is no question that grading

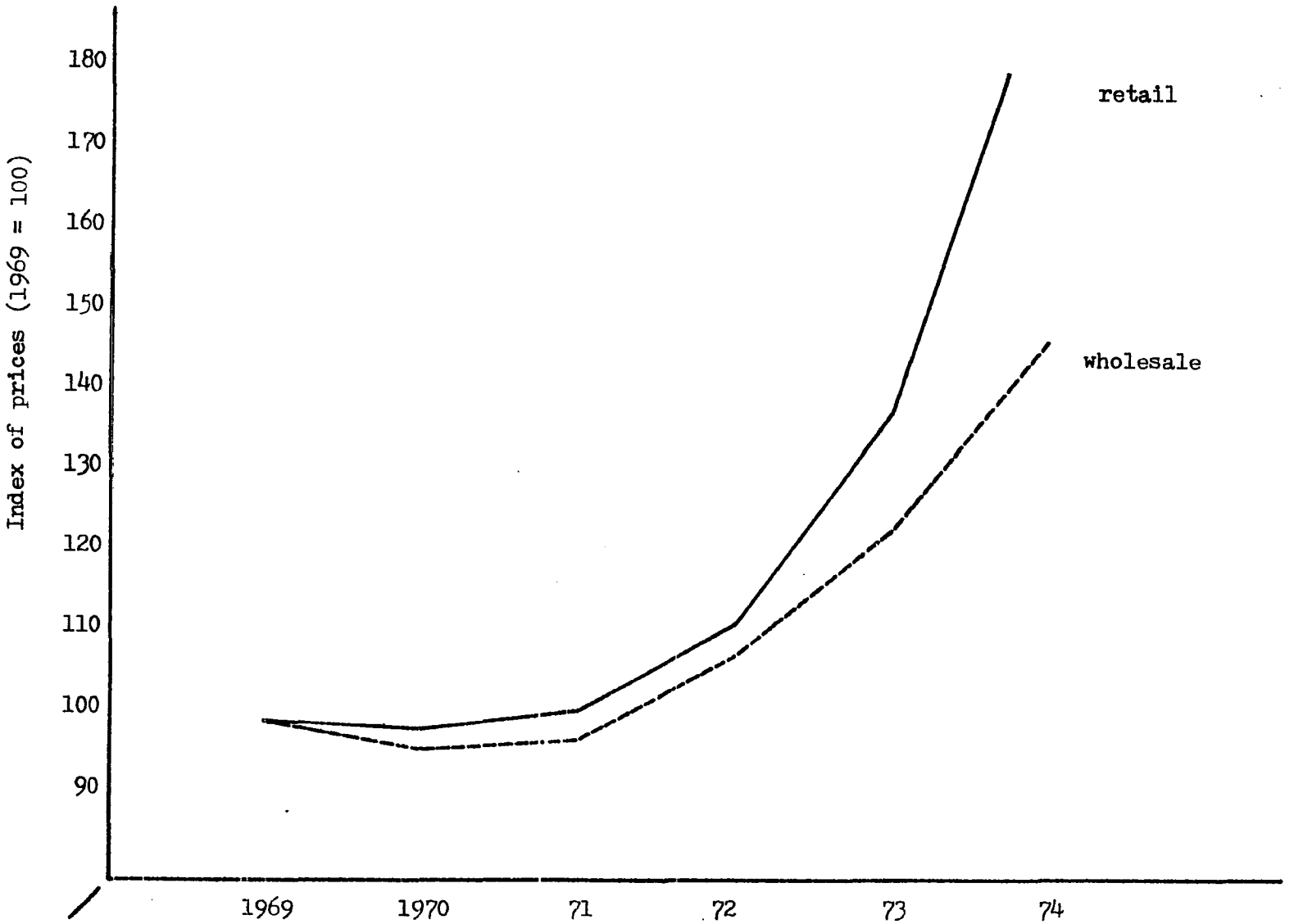

Figure 3. Wholesale and retail price index for mutton market

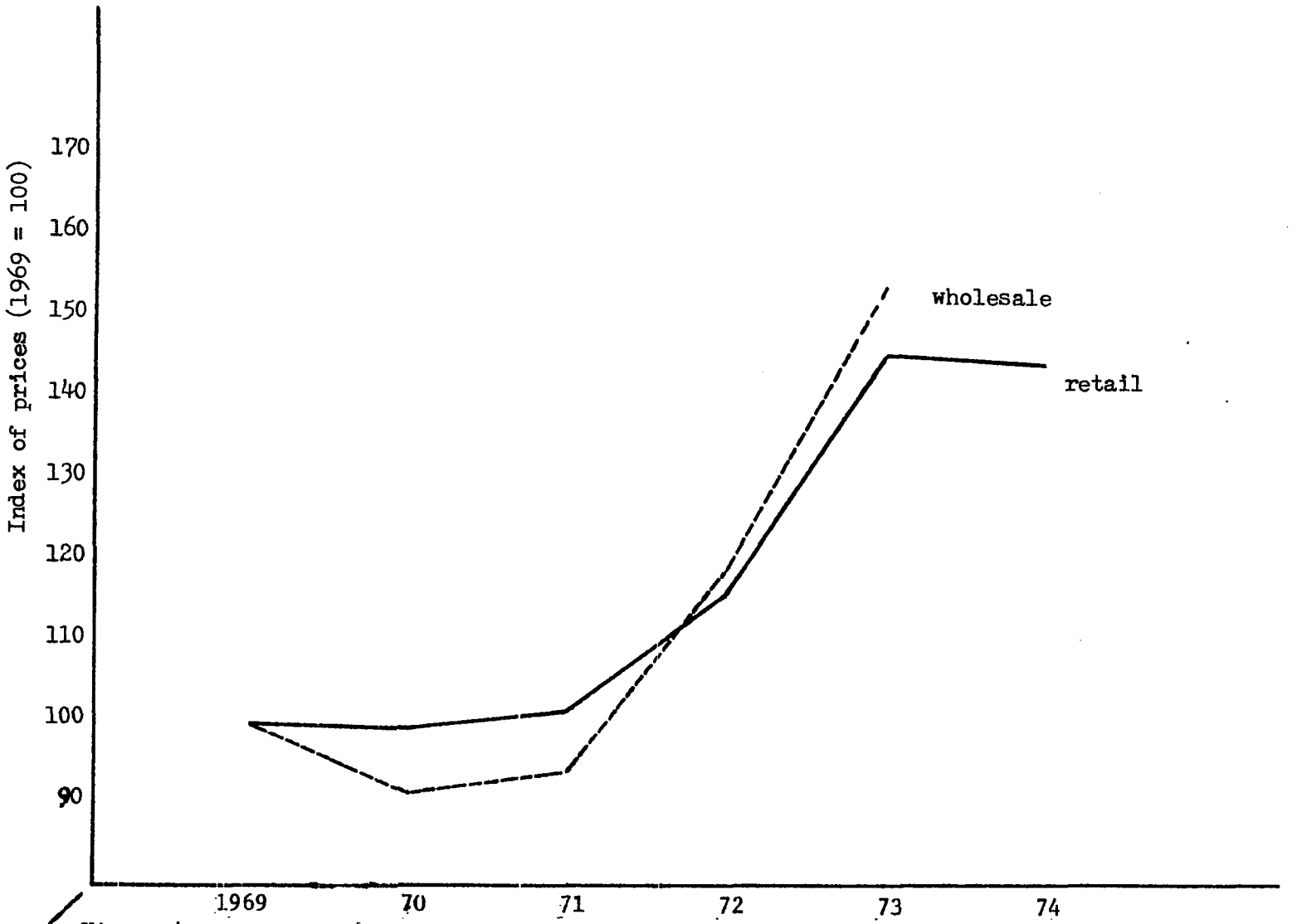

Figure 4. Wholesale and retail price index for beef market

to some extent would ease the black market. Under a grading system, prices would better reflect consumer tastes and preference than does the present system of price fixing. Also, butchers cannot violate the prices by selling low-quality meat to consumers.

Another factor affecting producer prices and wholesale prices is the price of slaughtered animal by-products. The value of skins and offal, although varying from one year to another, is worth from 250 to 500 rials, based on animal weight and quality of skins (See Appendix, Table 51, details of by-products prices). The Meat Organization in Tehran purchases animals based on carcass weight and sells by-products per kg meat for an average of 25 rials or 19 per cent of the selling price. Based on the purchasing of meat by carcass weight, it makes it more profitable for the syndicate and butchers in slaughterhouses to buy two lean animals instead of one fat animal and to sell two by-products (two skins and two sets of offal) instead of one by-product. Brown et al calculated that the price difference between heavier and lighter animals was 1.12 rials per kg in favor of the lighter animals (25). Also, due to the lower prices for fat, animals with higher percentages of fat are not profitable as the lighter ones.

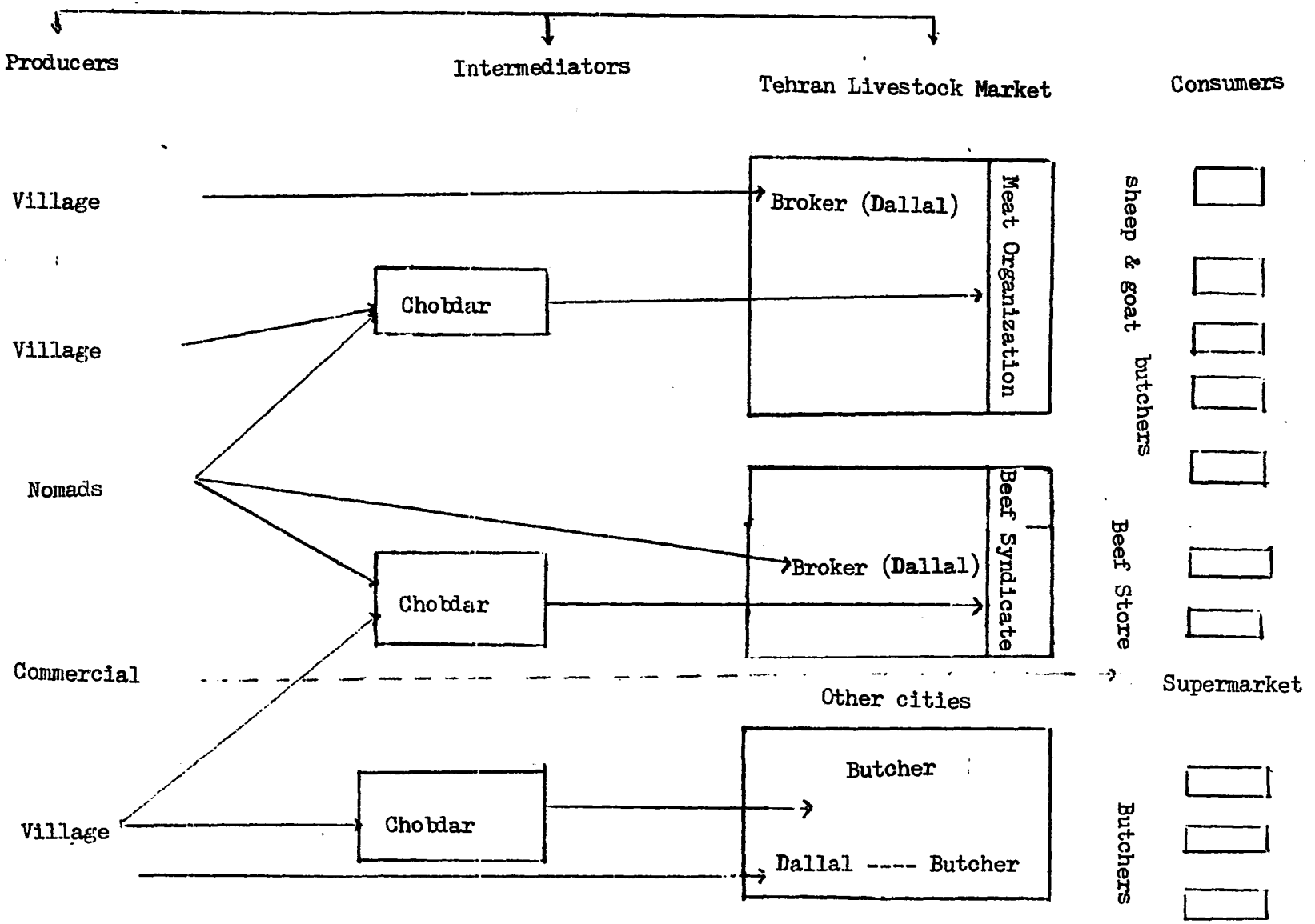

Chart 1. Livestock marketing system in Iran

Table 19. Retail price index for meat (1969 = 100)

Year	Sheep without bone	Sheep with bone	Beef without bone	Poultry
1959	58.1	55.0	47.5	79.9
1960	66.2	62.8	54.7	82.7
1961	70.7	67.7	56.5	84.7
1962	73.7	71.3	60.3	84.9
1963	77.5	75.7	66.7	84.8
1964	88.5	85.8	75.2	93.0
1965	91.2	89.5	79.0	96.3
1966	90.6	88.4	80.1	93.1
1967	96.1	94.4	88.5	95.9
1968	98.4	98.6	98.3	97.9
1969	100.0	100.0	100.0	100.0
1970	99.8	97.4	99.6	100.8
1971	101.3	100.6	101.2	111.9
1972	111.7	115.0	115.3	116.8
1973	138.0	143.9	145.0	131.5
1974	185.0	184.1	144.2	152.0

[a]Sources: Bank Markazi Iran (12), wholesale price index in Iran (1338-52).

Table 20. Wholesale price index for meat (1969 = 100)

Year	Meat - sheep goats	Live animals			
		Hens	Cattle	Sheep	Goats
1959	58.7	73.6	45.2	55.0	46.4
1960	67.6	79.4	52.7	64.0	55.5
1961	70.8	86.1	55.1	64.8	59.4
1962	73.8	87.1	60.0	67.8	60.2
1963	77.5	88.8	66.0	72.2	64.4
1964	88.1	88.1	74.7	83.6	77.0
1965	89.8	88.8	78.1	84.8	79.7
1966	88.6	89.2	82.5	85.6	84.9
1967	94.6	94.0	92.8	93.4	93.2
1968	98.2	95.1	98.2	98.0	98.5
1969	100.0	100.0	100.0	100.0	100.0
1970	96.5	95.9	91.3	90.6	89.7
1971	97.3	112.4	93.8	98.3	90.2
1972	107.9	115.0	118.9	121.3	120.7
1973	123.7	122.2	153.1	144.0	150.2
1974	147.0	143.4	--	--	--

[a]Source: Bank Markazi Iran (12).

CHAPTER V. FACTORS AFFECTING DEMAND FOR MEAT

In a study of the livestock industry in Iran, it is important to determine those factors which incluence demand for meat. The demand for meat in general is determined by the following four major factors.

Population

A very important element in total demand for meat is the number of consumers. Population growth in each country is directly responsible for the increase in demand for meat. Countries with high-rate population increase, such as Iran (3 per cent annually), would demand more meat in the future.

In addition to the rate of population growth, the composition of the population (rural/urban), and the ages of meat consumers are also important in the rate of increase for total meat demand. A high rate of migration from rural to urban areas in Iran has caused more increase in the total demand. This increase is the result of a change in diet composition and the availability of more meat in the cities. The dualistic nature of livestock as capital assets and consumption goods, makes it special in the viewpoint of owners in rural areas. In villages, livestock is considered a capital asset and a source of income flow for family daily expenditures. Therefore, villages are willing only under very special circumstances such as sickness in animals, ceremonies or special occasions to slaughter their animals for meat consumption. In 1959, only 33 per cent of 21 million Iranians were living in urban areas,

and 67 per cent of the population were settled in rural areas.[1] However, due to the high rate of migration from rural to urban and growing popluation of small towns, the composition has changed drastically. Based on the Centeral Bank report, the population of rural area with an average rate of growth of 1.64 in 1974 has reached 18.4 million which accounts for only 54.6 per cent of the total Iranian population. On the other hand, urban population with a high rate of growth (averaging 4.9 per cent) has reached 14.8 million or 44.6 per cent of the total population.[2] Many economists have stated that urbanization facilitates agricultural development and growth especially effect on rapid growth for commodities such as meat and milk (55).

Income per Capita

Consumer expenditures or disposable per capita income (taxes deducted from per capita income) show the ability of the consumer to buy commodities. Real per capita disposable income, which takes into account inflation, is the second most important factor in determining the demand for meat. Mellor (55) stated that in certain stages of development, the income effect on demand for food may be more important than the population effect. Indeed, the income effect on demand for meat in

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[1] Urban population assumed in Iran census as population of places over 5 thousand inhabitants.

[2] The Centeral Bank of Iran estimate is based on information from two census in 1335 and 1345 Iranian year. The urban area population in 1959 was growing at a faster rate - 5.19, compared to 4.57 in 1975.

Iran has substantially surpassed the population effect. Even though population growth is rapid, income growth in Iran has been very rapid. The effect of per capita income growth on demand for meat in Iran is three times as important in Iranian meat demand as the growth in population. Perhpas the effect of income increases will become less important in the future in Iran. Engel's Law is a well-known economic phenomena. Engel discovered that increases in the level of income cause the ratio of food expenditure to total income to decrease, even though the absolute amount spent on food consumption continues to increase. Engel's Law also applies to products other than food.

Income Demand Elasticity

In order to study the income effect on patterns of demand for products, income elasticity for demand is the best tool for analysis of this phenomenon and it has been applied widely in demand-projections and forecasting for future demand. Income demand elasticity is defined as "a percentage change in quantity demanded for a specific product as a result of a percentage change in per capita income." Income demand elasticity can be written in formula as follows:

$$E_{di} = \frac{\Delta q_i / q_i}{\Delta y / y}$$

where E_{di} is income demand elasticity for i product

Δq_i is changes in quantity of demand for i product as a

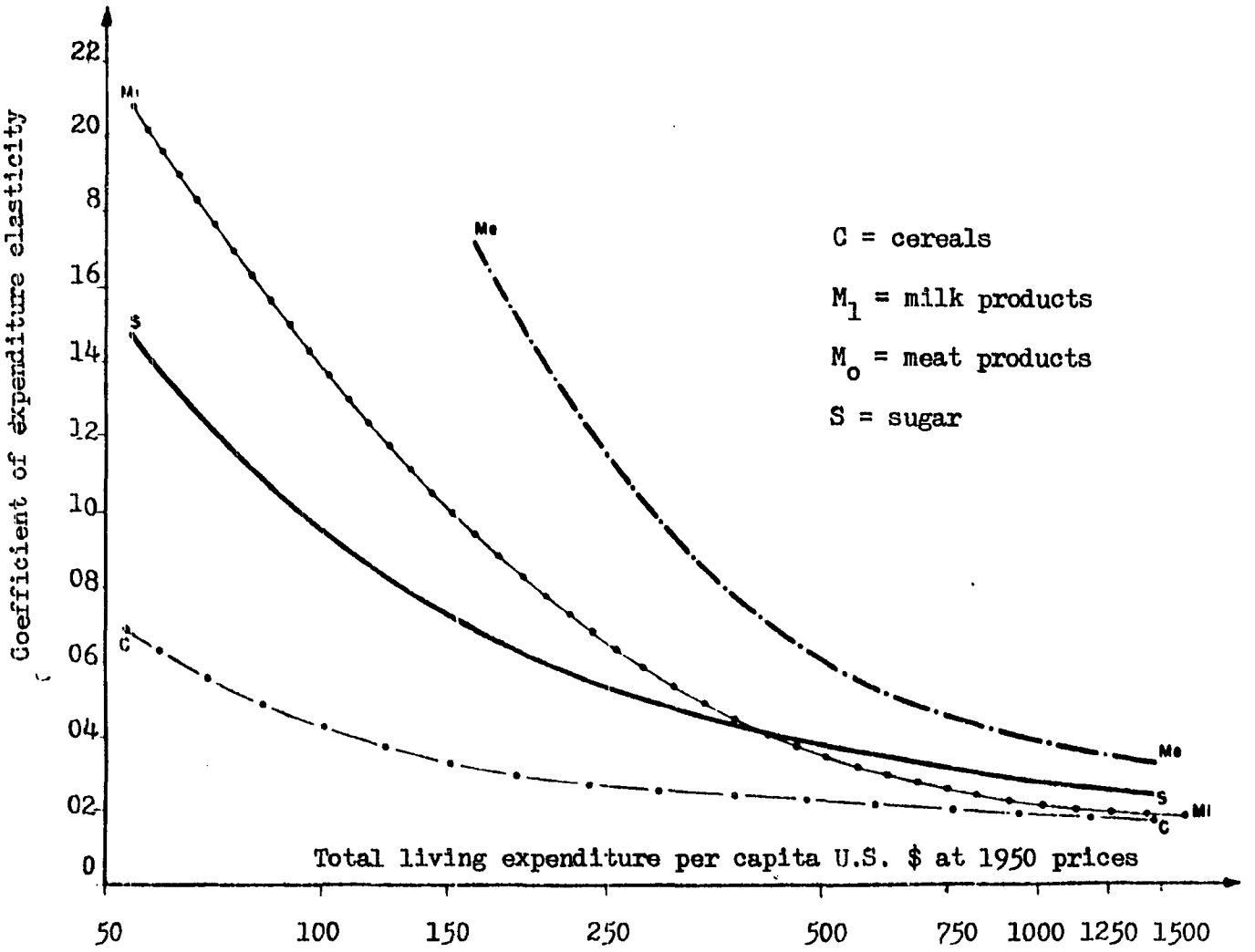

Figure 5. Trends of expenditures on selected commodities

Sources: World meat economy (29).

result of changes in income

Δy is changes in per capita income

y is per capita income

q is income demand quantity

There are several methods for measuring income demand elasticity. Time-series and consumer-budget studies or cross-sectional studies are the two most popular methods for estimation of demand elasticities, although each one has advantages and disadvantages. The cross-section method advantage is mostly useful in countries where there is no reliable data available for the long period of time necessary for study by time-series. The time-series advantage is considered in regard to the time span which measures all effects over time, including prices and changes in taste and preference. The most recent studies consider a combination of time-series and cross-sectional studies as the most appropriate method in measuring demand elasticities over time.

Coefficient of Expenditure Elasticities for Meat

Among a group of foods, meat has an exceptional income demand elasticity. Figure 5 shows trends of elasticity of expenditure on selected commodities, such as cereals, milk products and sugar. In comparison with meat, all these elasticities lie below meat as expenditure per capita has increased. Meat will be consumed up to a level where it reaches saturation.

FAO studies on meat consumption have found a direct relationship between per capita meat consumption and per capita income among countries. In a cross-sectional regression analysis, most countries and areas adjust

by the curve which is represented in Figure 6. Except for Japan which is below and South American and Oceania which are above the curve, other countries and areas lie on the curve. Developing countries with a low level of income have a lower level of per capita meat consumption.

Income demand elasticity for varieties of meat is different. In Iran, income demand elasticity is higher for poultry than red meat in general. The income demand elasticity estimated by Iran's statistical center (ISC) for urban families in Iran is based on cross-sectional data in the 1972 family budget survey. The income demand elasticity for poultry, mutton, beef and meat, estimated by ISC are 1.76, 1.18, .35 and 1.02, respectively.

Other studies (50), (30) show lower income demand elasticities for urban population and higher income elasticities for rural population for mutton and lamb. Table 21 shows estimates by different sources for urban and rural areas for income elasticities of different meats in Iran. The Plan Organization in its projection of demand for meat 1977 and 1992 has used a lower income elasticity based on high income per capita in those years. Although the elasticities for mutton are assumed to remain the same, the income elasticities for beef will decline from -.180 and .584 to -2.88 and .309 for urban and rural areas in 1977 and 1992 respectively.

Estimations by different sources on Iranian income elasticities for meat sometimes are contradictory. However, one can generalize that on the average, the income elasticity of demand for mutton is around 1.0; for beef (less than mutton) at probably .8; and for poultry, over 1.50 (probably 1.7). One can easily distinguish the higher income demand

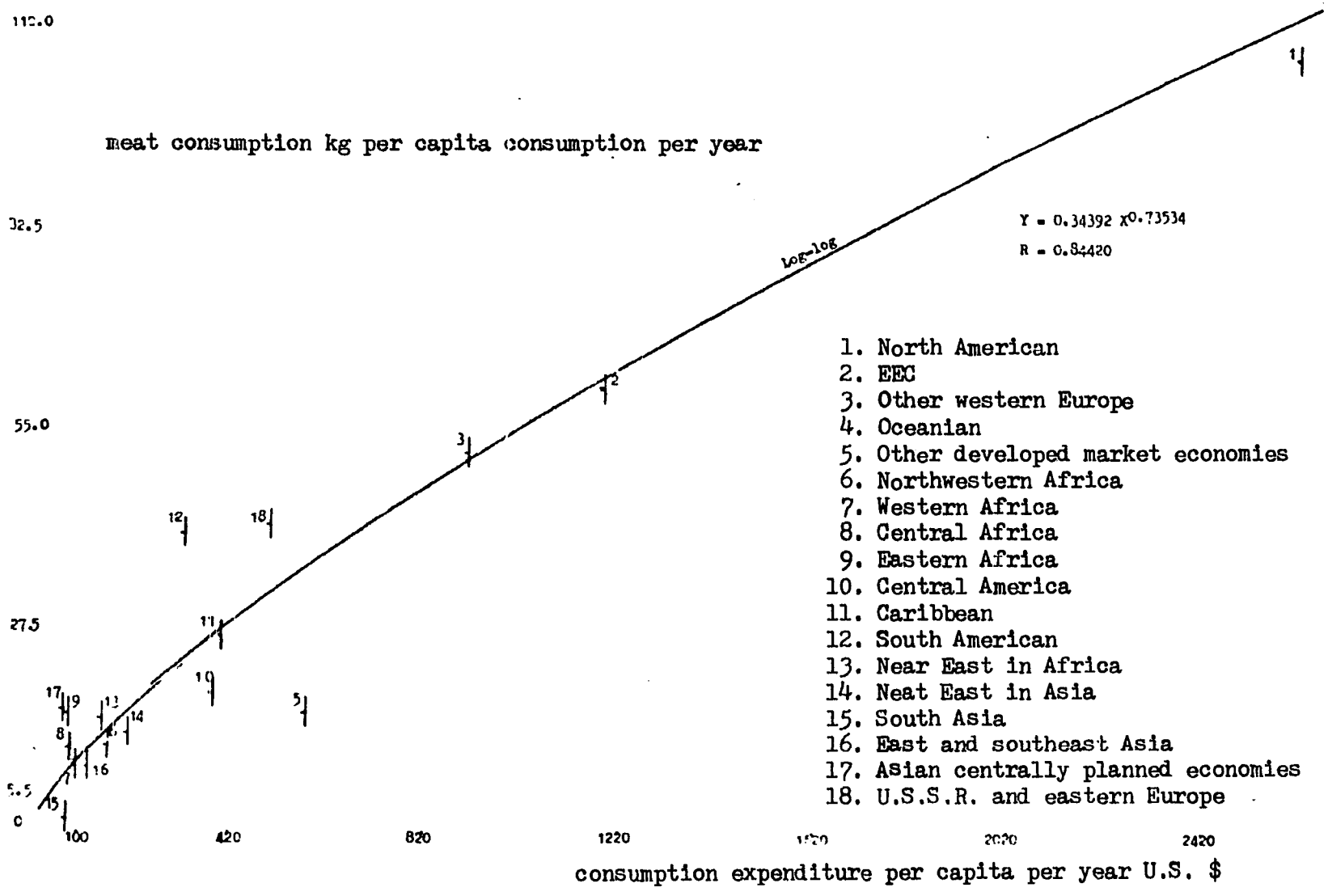

Figure 6. Relationship between per capita meat consumption and per capita consumption expenditure.

Source: FAO (29).

elasticities for all kinds of meat in rural areas over urban areas is mainly due to the low level of income and the low level of meat consumption at the present time. The higher income elasticity for mutton and lamb in comparison with beef shows the strong preference of Iranians in demand for lamb and mutton consumption.

The income demand elasticity for meat is also dependent on the present level of consumption. The smaller the level of meat consumption, the greater the elasticity for meat and vice versa. The less people consume, the greater is their desire to have more. The FAO classified income and average meat consumption into four groups. Each group is based upon income demand elasticites for meat. These considerations might suggest that, besides policy influence, meat is likely to expand most rapidly in countries which have low meat consumption and low incomes, provided their economics develop and their people become more wealthy. For these reasons, the potential growth market can be identified only after a study of combined effects of income elasticities and current consumption in conjunction with the population of the countries. Table 22 shows the relationship between average income elasticities, average per capita consumption of meat and average per capita income for a group of countries.

Iran, with an average per capita red meat consumption of around 13 kg a year, is in the group of medium-to-high elasticities, but Iranian per capita income is not consistent with this classification. This situation is chiefly caused by rapid growth in the GNP due to oil income, a lag in meat consumption due to income distribution, and constraints on the supply of meat in Iran, accompanied by a high rate of increase in meat

Table 21. Income demand elasticity estimation for meat in Iran

Source of Estimation	Year of Estimation	Type of Equation	Mutton & Lamb		Beef & Veal		Poultry		Meat	
Type of meat			Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Plan Organization	1977	Linear	.621	.898	- .180	.438	.897	1.31	---	---
Plan Organization	1992	Linear	.621	.898	-2.88	.309	.976	.438	---	---
Iran Statistical Center	1972	Double-log	1.186	---	.351	---	1.760	---	1.208	---
Ranaghy	1959	Linear	.743	1.4	- .040	.800	2.264	3.0	.86	1.517
FAO	1975	Semi-log	.97		1.00		1.50		---	---
IBRD World Bank	1975	----	.51	.96	.94	.90	1.51	1.36	---	---
LeBaron	1969	Double-log	.87	2.43	.37	1.80	1.72	2.31	---	---
Author[a]	1976	Linear	---	1.211	---	1.685	---	6.4[b]	---	1.436

[a]Based on budget survey of rural families in 1351 by Iran Statistical Center, published in 1975.

[b]Rural poultry demand elasticity is unusually high, reflecting a very low level of consumption at lower levels of income.

Table 22. Average income elasticites for meat, meat consumption and national income per capita for groups of countries

Country Group	Average Income Elasticities	Average Consumption Kg	Average National Income Dollar
Low Income Elasticities (up to 0.2)	0.15	100	990
Low to Medium Elasticities (.35 to .6)	0.50	60	1075
Medium to High Elasticities (0.7 to 1.3)	1.00	24	320
High Elasticities (above 1.3)	1.50	10	130

[a]Source: FAO Comm Market (29).

prices.

Income Per Capita Projection for Iran

The high rate of growth in per capita income during 1970-75 is not an ordinary phenomenon in world economy. Even planners with very optimistic points of view, did not anticipate more than an 11.4 per cent growth during the 1972-77 Fifth Development Plan. Fluctuations in oil revenue (the major source of investment) as a result of price or production variation will be considered to be the same as in the early 1970's. In the future, therefore, the projection for per capita income growth rate in the next 10 years with regard to all prevailing data will be around 10 per cent. The significance of the effect of oil revenue on Iranian economy will continue to dominate the economy for at least the next 20 years; hence any major change in the oil market could cause serious upward or downward influence on the economic growth rate in Iran.

Consumer Budget Survey

A budget survey of rural and urban family expenditures [1] in 1972 revealed some important facts about consumption patterns in Iran. In urban areas, the percentage of family expenditures on food is decreasing, but in absolute value it has increased. Only 43.6 percentage of the expenditure in 1972 was spent on food, compared to 46.9 per cent in the previous year. However, in absolute value, expenditures on foods

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[1] There is a major difference between "expenditures" and disposable income of a family. In a later case, saving is included, which makes a substantial difference with disposable income and in particular is important in urban families.

have increased by 10.2 per cent, whereas the total expenditure increased 18.7 per cent with respect to the previous year. In rural areas, the total expenditures (food and non-food) have decreased one per cent, while the expenditures for food have increased by one per cent.[1] This is in contradition to Engel's law, indicating that people in rural areas are still undernourished and as their income increases, they are willing to spend more on food rather than on non-food items. This also confirms the statement that in the early stages of development before reaching a sufficient nutritional level, per capita consumption of all foods will increase as income per capita increases. Although expenditures on high cost foods such as meat and dairy products in rural areas have increased, this increase can be justified more by price increases rather than by quantity increases.

In urban areas, the percentage of expenditures for meat (the second most important item in food items) has increased from 19.7 per cent to 21.4 per cent in 1972. Simultaneously, urban percentage expenditures on cereal have dropped from 29 per cent to 27.5 per cent. However, the expenditures show a small increase (4.3 per cent) in comparison to the previous year. Meat and dairy product expenditures in 1972 show the sharpest increase with respect to other items on the food list. Meat and dairy products increased by 19.6 and 26.4 per cent respectively in 1972 in comparison with 1971. The combination of dairy and meat expenditures for the first time surpassed the cereal category expenditure in 1971.

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[1] In 1971, agricultural sector income has decreased 3.7 per cent with respect to the previous year.

In rural areas, by far the most important item of food consumption is cereals, and in spite of an increase in income, the gap between food groups expenditure remained the same. In 1972, 42.5 per cent of food expenditure was devoted to cereals, whereas only 15.5 per cent and 10.5 per cent were spent on meat, dairy and egg products respectively. Since each urban family in 1972 spent more than 47 per cent to a rural family. This portion for meat expenditures has even become more (2.1 times). Therefore, all indications suggest that rural societies are still suffering from low nutrition, and the rural consumption of meat in any future period will increase tremendously as income increases. One must take into consideration that the increase in meat consumption will be a result of two forces; One, the substitution of low-cost foods for high-cost foods and two, a very low level of meat consumption in rural areas. The survey of budget expenditures for rural families also shows a great inequality of income among provinces. For example, the total expenditures of a rural family in the province of Gillan are three times greater than for a family in the provinces of Sistan and Baluchestan. A family in Gillan spent 1,436 dollars in 1972, in comparison with only 472 dollars spent by a Baluchi family in the same period. Consequently a family in Gillan has spent an average of 3.3 times more than a family in Baluchestan and Sistan on meat consumption.

The inequality among provinces suggests that in the near future as the income per capita increases, the meat consumption in low income provinces will increase faster than in other provinces and most meat production will be consumed locally rather than used to supply other provinces. However, if the price differentiation among provinces as it

at present[1] vanishes, high price elasticities for meat prevent consumption locally more.

Prices

Rising prices will tend to decrease consumption and increase production. The concept of price demand elasticities denotes a percentage change in quantity demanded of a commodity as a result of percentage changes in the price of that commodity. Information on price elasticities is important, if one is interested in the configuration of changes in consumption and supply as a response to changes in prices.

Equilibrium prices of a commodity are determined by quantities demanded and supplied for that commodity. The change in equilibrium price is different from price changes in supply and demand schedules. Therefore, one must be careful to distinguish between these two changes in prices. In most projections of demand and supply, one main assumption is that relative prices will be constant over time. Any changes in price of a commodity will be compensated for by rising input costs, and the price of other products; therefore relative prices will remain constant.

The high increase in meat and dairy prices in Iran in comparison with other commodities is the result of a sharp rate of increase in the demand for meat and slower rate of increase in the supply of meat and dairy products. Agricultural commodities with high income elasticities of demand (such as meat) and low supply growth (domestic and imported)

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[1] At the present time, the governors of provinces have limited the export of meat from their provinces. In addition, fixed price regulation and government subsidies in Tehran have kept meat prices lower in Tehran than in other provinces.

will face an increase in prices. However, the price increase will curb the consumption since the price elasticity of demand for these commodities is also high (55). For example, income demand elasticities for dairy products in low income countries is high (around 1-1.5), and therefore, the price elasticity is also high (-1.5 to -2). Therefore, if the demand for milk increases by 10 per cent and supply does not increase, milk prices will increase by 5 to 7 per cent. If there is no restriction on the market, the price increase will absorb large increases in the purchasing power of consumers.

In developing countries the lack of data in terms of time series make the estimation of price elasticities of demand difficult if not impossible. To avoid this handicap, the assumption used in studies of agricultural commodities is that the sum of the price elasticity, income elasticity, and gross elasticity is equal to zero (55). Thus, for developing countries such as Iran, the price elasticity of demand for animal products would be around -1.5.

In Iran, the price of all types of meat (mutton, beef, and poultry) has increased sharply. From 1970 to 1975, wholesale meat prices for sheep and goats increased more than 52 per cent. However, the retail price index by Centeral Bank of Iran showed an even higher increase. Sheep meat prices increased in the same period by 90 per cent, while the beef and poultry prices rose by 53 and 51 per cent respectively. The sharpest increase occurred during 1973-1974, in spite of large increases in amounts of imports of red meat. The price increase for the meat group (fish, poultry and red meat) was more than 25 per cent in 1974 with respect to the previous year. However, red meat prices

in particular mutton price, increase was much higher among the meat group. One also has to take into account price control and government subsidies in order to keep prices down. There is no question that without government intervention, the price of most food products (meat in particular) could have been much higher than what it was.

One other factor which also helped the increase in meat prices in Iran was a price increase in international meat markets. The price of meat imported by the Meat Organization has increased 96 per cent from 1972-1975. These are indications that Iranian meat imports in increasing amounts in the future will be possible only with higher costs and in limited amounts. A study by FAO on marketing of livestock in the Neareast region has confirmed that the region as a whole faces a widening gap between domestic production and consumption of meat (89).[1] Table 23 and Figure 7 show the trends of consumer price index, food, and meat price indices from 1969-1975. Food prices increased more than the consumer price index, but the meat price index had even a higher increase with respect to food or consumer prices. In particular, the difference in the last three years increased sharply.

Meat import prices and transportation costs have increased even faster than have domestic meat prices. Table 24 shows the import prices and transportation costs for different types of meat from 1972-75. Australian frozen mutton prices doubled during 1972-74, but became stable in 1975. Fresh mutton import price is two times more expensive than the

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[1]Near East region countries in this study include Iran, Turkey, Lebanon, Syria and Egypt.

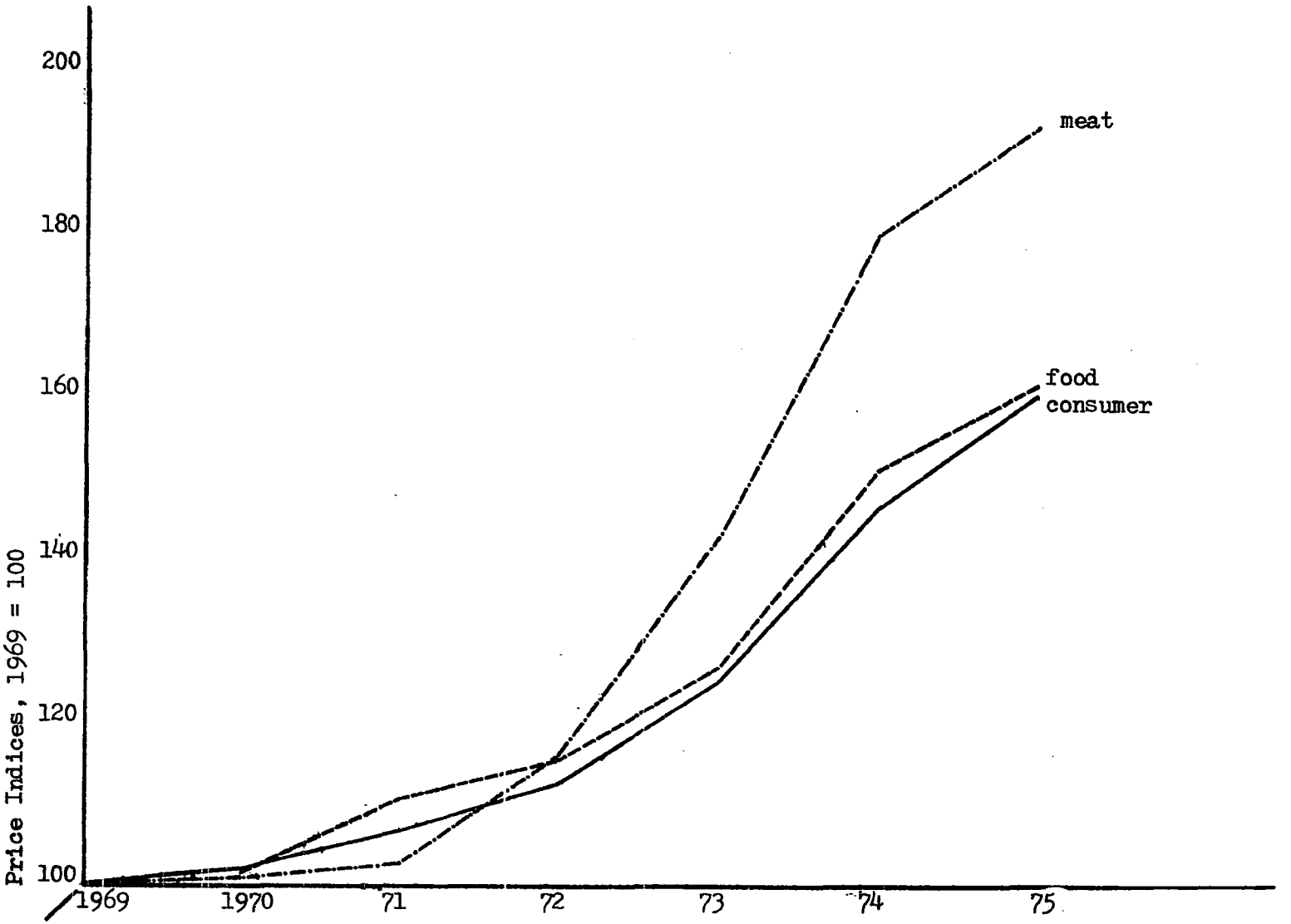

Figure 7. Trends of consumer price index, food and meat price indices (1969-1975)

Table 23. Index prices for consumer, food and meat (1969 = 100)

Year	Food	Consumer price index	Meat price
1969	100	100	100
1970	100.4	101.5	101.0
1971	110.1	107.1	102.9
1972	117.2	113.8	116.7
1973	127.0	126.5	142.7
1974	151.3	146.1	179.5
1975	161.5	160.5	193.7

[a]Source: Bank Markazi Iran (9) (10).

Table 24. Imported meat prices by Meat Organization (per ton, U.S. dollar)

Country of Origin	Type of Meat	1972	1973	1974	1975	Percentage price increase 1972-75
Australia-New Zealand	sheep[b]	426.16	776.00	884.00	884.00	107
transportation cost	(live)	39.58	44.10	44.40	49.60	25
Australia-New Zealand	frozen meat[b]	663.00	1,225.00	1,275.00	1,300.00	96
transportation cost		158.30	176.40	177.60	197.40	24
Bulgaria	fresh mutton[c]	-----	-----	2,425.00	2,425.00	---
Hungary	fresh mutton[c]	-----	-----	2,033.00	-----	---

[a]Source: Foreign Trade Statistics of Iran (33) (34).

[b]Prices are c.i.f. prices (port entry), and transportation costs from port to Tehran are not included.

[c]Transportation costs are included, since meat was transported from origin by refrigerated trucks to Tehran.

the frozen meat.

Other Factors Affecting Demand for Meat

In addition to population, income per capita, and prices, there are other factors which are important to lesser extents. One also has to recognize the interaction of variables affecting demand. A high income demand elasticity for meat is accompanied by high price demand elasticites. A high rate of population growth tends to lower per capita income, on one hand, and increase demand on the other hand. Prices also play two roles on demand for meat. An increase of meat prices increases the income of the rural population and also the production of meat on one hand, and on the contrary decreases the demand through the negative effect of prices. However, the positive income effect of demand is more than the negative price effect of demand in early stages of development.

Other factors affecting demand for meat in Iran are (a) availability of meat (b) age structure, (c) tastes and preference of consumers, and (d) marketing.

(a) Availability of meat A direct link between meat production and demand for meat exists. Countries who are major producers are also major consumers. Exporting meat countries are also ranked at the top of per capita meat consumption in the world. Countries like Argentina, Australia, New Zealand, and Uruguay (major meat exporters) also are among the ten high per capita meat consuming nations. In general, their meat was produced and consumed locally and only 8 per cent of their meat production traded internationally. In Iran imports and exports of meat on the average accounted for less than 5 per cent of meat consumption, but

this relative self-sufficiency seems to be losing ground for meat imports in recent years.

(b) Age structure and family size The age structure and size of family affects the demand for meat. Children less than 10 years old and older adults consume less meat compared to other age groups. In Iran where age group composition trends in the last two censes showed a tendency toward a younger population (due to a high rate of fertility and a lower rate of mortality, in particular among infants). Thus, the future demand for meat will change significantly as a result of changes in age structure. Census figures in 1956 and 1966 showed 42 and 46 per cent of the population of Iran respectively under 15, with only 4 per cent are over 65. The respective figures for Germany in 1964 were 21 and 13 per cent (75). As a result of the younger generation, demand for meat will increase faster in the near future relative to present demand. The size of the family is also important in meat consumption. Large size families consume more meat in general, but per capita meat consumption decreases as the size of family increases. In Iran, family size is far larger than in most Western countries, with an average family size in Iran in 1972 of 5.1 per family. If trends of urbanization and decline in fertility continue as predicted (75), smaller family size will tend to increase demand per capita for meat.

(c) Tastes and preference of consumers Demand for meat is affected by tastes and preference of consumers. The religious and cultural background of the people will definitely influence the market demand for meat. Iran's preference for mutton and lamb is the result of two major factors: the Islamic religious prohibitions against eating pork and the Middle

Eastern cultural background prefering mutton over beef. In Iran, the types of meatcuts, dishes served, and consumer preference for fresh meat over frozen are reflected in price differentiation and scarcity of a particular type of meat at butcher counters. There are other factors, such as occupation, substitutability of other foods, and seasonal fluctuation which affect meat demand.

(d) Marketing The marketing of meat in retail stores is important in meat consumption. Cool storage, refrigerated transportation and other methods of distribution have substantially changed the marketing of meat in Iran. Hundreds of small butcher shops in cities sell meat to customers. Beef and mutton shops are separate with each one selling small amounts of meat per day. Each shop attracts only a small number of people from a few blocks surrounding the shop. There is no definite detail grading, and sometimes there is no choice between meat with bone or without bone. Packaging and grading of meat could change the attitudes of customers; price differentiation in this regard will better reflect consumers' opinions.

Demand Projections

There have been several studies regarding the demand and supply projections for agricultural productions in Iran. Future demand for livestock products in general and meat consumption in particular, have been analyzed from different points of view. FAO (30), IBRD (42), LeBaron (50), Ronaghy (86), Saleh (88), and consultant companies, Bookers and Hunting Ltd. (22), to name a few, have projected the future demand and supply for Iran. These studies have reached the same conclusion; i.e., that the high rate of growth in demand

for animal products (around 10 per cent) will surpass the low rate of growth of supply (5 - 6 per cent). However, the consumption trends which have already appeared cause a net trade deficit for many animal products. The extent and type of products can definitely be attributed to the government policy in the agricultural sector. Limited resources, lower prices for meat and feed, water, land, capital, competition from the other crops for water and land, and human resources, have been mentioned as obstacles to the policy of self-sufficiency.

Demand projections have been studied in lieu of consumers' tastes and preference, and figuring potential demand is considered an easier task as opposed to supply. Population and disposable income per capita are the two major factors of growth in demand and can be estimated through past performence and future trends. On the other hand, supply estimation is a burdensome task not only because of uncertainty or the technological development process in future years, but also due to lack of sufficient information and statistics about past and present situations.

Table 25 shows the different estimates for demand of red meat and poultry from different studies. Projection figures varied from one study to another, based on assumptions about income growth, government policy, population growth and income demand elasticities for meat. Projections range from 30 per cent self-sufficiency in livestock products (FMC (32)) to as high as 50 per cent by Bookers and Hunting Ltd. (22).

All projections for 1975 red meat consumption (Table 25) in 1975 in comparison with actual reported by Centeral Bank (Table 14), are underestimated by 30 to 60 thousand tons. LeBaron, for example, in 1969

projected red meat consumption would be 499 in 1975 where the estimate was 567 thousand tons. Poultry consumption was estimated at 115 in 1975 against the 83 thousand tons projected by LeBaron.

The differences can be justified in two ways. In one explanation, one can argue that the Ministy of Agriculture over-estimated growth rate of meat production in 1975. This is not surprising, since it is possible to make over-estimations or under-estimations, due to lack of data on slaughtered animals or any other comparable figure for consumption. The Centeral Bank estimate in prior years was based on household consumption surveys which were always higher than figures estimated through production by the Plan Organization. Therefore, estimates can be different from projection figures.

On the other hand, one can argue that due to the higher income growth during 1972-74 as a result of the higher oil income, demand projections for meat were under-estimated. The fact is that there is a possibility that both explanations are correct to some extent and projected figures are not very different from the actual ones.

Table 25. Demand projections for meat consumption in Iran (in thousand metric tons)

Source of Estimates	1975			1980			1985		
	Mutton	Beef	Poultry	Mutton	Beef	Poultry	Mutton	Beef	Poultry
FAO (low estimate)	330	116	67	341	171	51	547	279	157
FAO (high estimate)	363	168	80	341	171	51	570	299	173
IBRD (1970)	383	116.3	85	489	150	120	618	192	164
LeBaron (1969)	360	139	83	446	172	106	---	---	---
Saleh - A	---	---	---	592	200	98	---	---	---
- B	---	---	---	678	---	---	---	---	---

[a]Sources: FAO (30), IBRD (42), LeBaron (50) and Saleh (88).

CHAPTER VI. FACTORS AFFECTING MEAT SUPPLY

Changes in production techniques and economic structure of the livestock industry in the long run will help to determine the cost of meat production and thus influence national and world markets. Factors affecting the supply of meat are different from one country to another, based on their resources, climate, and social structure.

Actually in a very broad classification, two different systems of meat production exist -- intensive and extensive types of production. The United States, Western Europe, and Japan are mostly involved in the intensive type of meat production. Feed grain is heavily used to produce more meat from each unit of animals. Technological development in this method has improved the ratio of feed grain per unit of meat production. This system of meat production, in particular, has been used in beef and pork production.

Several factors are responsible in dividing the countries into these two techniques of meat production. Extensive and intensive techniques of meat production are based on relative factors proportions of the land and labor. The land - labor ratio influences the type of production and world-wide trade patterns. If pasture land is more plentiful relative to labor, extensive techniques of meat production prevail. On the other hand, if cultivable land on crop production is more plentiful than grass, then more grain will be used per kg of meat production as in the case of the U.S.

It is possible that a country, due to the low level of income and population growth which, of course, effects the demand for meat, can

become a net exporter, even though the per capita meat consumption is at a low level (which was the case of Iran prior to the 1960's). In countries where the feed resources produce far from the consumption market (mountains), extensive techniques of meat production which bring animals to the feed production centers, dominate the type of production.

The average live-weight and carcass-weight have increased per animal in the last two decades as a result of technological advancements. In Belgium, for example, cattle live-weight increased, on the average, from 495 kilograms to 554 kilograms from 1964-70.

The extensive type of production can be found in the River Plata countries (Uraguay and Argentina) and Oceania countries (Australia and New Zealand). In this system of production vast amounts of land are devoted to animal grazing. Animals feed only through grazing on range or pasture. Feed grains constitute only a small part of their feed, mainly as a supplement. Animals in extensive production are lighter, compared to animals in the intensive type of production, and the per unit cost of meat production is less than in feed-grain meat production.[1] One obvious conclusion to be drawn from the comparison of countries in these two categories is that extensive meat producing countries are major meat exporters, whereas intensive producers are net importers of meat. Only 20 million hectares (12.3 per cent) of

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[1]One has to take into consideration that the land which is used in extensive types of animal husbandry are not competitive with crop production. It requires capital investment or some improvements in order for it to be converted for other cultivation. Therefore, the opportunity cost for land in other types of crop production is not very much under the present system.

Iranian land is cultivable and only 9.3 per cent of the land is being cultivated every year. Labor supply on the other hand is plentiful in rural areas, and the land used in feeding animals (mountain areas and desert) is abundant and does not cost for livestock producers. Therefore, the feed is priced at zero and is unlimited for the producers.

In Iran, an extensive system of meat production is labor-intensive, capital-saving, with a large amount of feed per kg of mutton production has been used by nomadic and villagers, and livestock producers.

In many countries, the intensive and extensive types of production exist side by side. The scarcity of suitable land in many countries has forced them to operate partially intensively. However, this transformation is accompanied by higher costs and institutional changes. In addition, for some countries such as the United States, the intensive type of production is a way to utilize the feed-grain surplus which otherwise would have no use domestically.

Range Animal Husbandry

In Iran, the meat production system is in the form of extensive production. Traditionally, Iran's climate, topography and land utilization economically and socially have evolved into the present system of animal husbandry. Mountains which cover one-sixth of Iran's land and valley ranges are suitable only for sheep and goats which can more efficiently use feed resources in this area. Temperature and seasonal differences developed the migratory type of animal husbandry. Shortages of water and frequent droughts developed through the selection of fattail sheep which could resist seasonal feed shortages.

Range Production

Livestock husbandry based on migratory flocks is unique in the Near East. Tribal ranges bounded in both parts of their destination were recognized by villagers and other tribes. Rangelands conditions were good, until the number of animals increased and some parts of rangelands went under cultivation. Ranges close to villages in particular were damaged more than others at farther distances from villages. Migration takes two to six weeks and covers distances as far as 450 km. However, if roads were available, the distance could be reduced as much as 150 km. During migration, sheep and goats used the grass around the path and utilize available feeds on their way to market destinations.

Studies on the migration of flocks from one place to another showed a substantial loss during the journey. Jones (46) for example estimated (based on his experiment) that the loss per sheep averaged 5 kg. Combined livestock weight-loss for all migratory animals could be as much as the total meat production in Iran in 1965. Economically, one has to recognize that this is not the most efficient type of feed-meat production, although under the present circumstances--feed resources in mountain areas--there is no other alternative. Studies regarding the transportation of sheep by truck or railroad found that in most cases there is no road available and in the case of access to roads, the costs for transportation for short distances is much more than the gain through weight gain.

In recent years, due to the increase in the number of livestock, range capacity limitation and increases in the area under cultivation (at the expense of range area), nomads have started to give their animals

some supplementary feed. An increase in meat prices also make it possible for them to feed animals economically. However, there is still the problem of access to foodstuffs, which is necessary in order to develop a system of supplementary feed for animals.

Villages Animal Husbandry

Livestock husbandry and farming are associated very closely with each other. Based on the agricultural census of 1972, 54.8 and 52.5 per cent of the family enterprises engaged in agricultural activities have sheep and goats, and cattle respectively. Each family involved in animal husbandry averaged 3.5, 17.3, 8.8 and 6.1 head of cattle, sheep, goats and poultry respectively in 1972.

The integration of livestock production and farming has many economic advantages for farmers. Crop rotation with feed production increases the land fertility. As a source of nutritional value, milk and meat contribute large amounts to undernourished families in rural areas. FAO estimated 30 per cent of milk production is from goats and sheep. As a source of energy, the utilization of draft animals and animal waste is indispensable under present conditions.[1] As a source of income, the value of animal husbandry goes beyond direct benefit. In general, 30 to 40 per cent of income is generated through livestock husbandry. In addition, wool and the hair of other animals are the major inputs for the carpet industry in rural areas, thus increasing the

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[1] Only 30 thousand tractors, 1700 combines and 20 thousand trailers were used for farming activities in Iran, with the concentration in the central, north and north-western and eastern parts of the country (81).

income of families in rural areas somewhat.

Livestock graze in the vicinity of villages or are taken to nearby mountain valleys. A flock of animals is comprised of sheep and goats, where the numbers of goats in arid and steep mountain areas are increasing relative to other areas. A flock of 250 sheep and goats has 2 shepherds who skillfully manage the flock and are familiar with pastures in the surrounding area. Owners of flocks vary from two to ten villagers who each own only a few head. Flocks usually leave for grazing in the early morning and come back in the evening, each sheep going to its owner's barn. In some cases, sheep go to mountainous areas in spring and stay for a month or two. Cattle are mainly for milk production and are pastured, with some supplementary feed.

This type of animal husbandry has become an institution in Iran, and changing the system is not an easy task. The strong tendency for a family to be self-sufficient in food and the system of barter economy in villages make this type of ownership and animal husbandry the most suitable one for the country. But due to substantial changes in the economy in recent years, the structure of agriculture and livestock industry must change in order to be adjusted with new techniques of production.

Commercial Production

Economic development and urbanization have created large markets for livestock and livestock products. The demand for dairy products, in particular milk, could not be met with the supply from villages surrounding the cities. Commercial poultry and dairy production do not have a long history. With the establishment of milk bottling factories

and a milk distribution system in Tehran and other cities, commercial milk production started with native and a few exotic cows. Commercial poultry production has expanded very rapidly and caused poultry prices to decrease for a while, before they started to increase in recent years.

There are two types of commercial dairy and poultry production in Iran. Dairy farms with exotic cows and modern equipment, very efficient in feed-milk production exist on the one hand, while dairies with native cows, less equipment and facilities, inefficient in production and management are also found. Poultry operations are also divided into two categories. There are some that are automated, capital intensive and very efficient operations as well as less efficient ones in feed-meat production with less capital utilization. Commercial modern farms are making a greater profit than are the less modern farms. However, they need substantial capital in the form of domestic and foreign exchange for equipment and animals.

Sheep-fattening firms operate only in winter, when they can benefit from cheap prices in fall, and higher prices in winter, in order to cope with higher costs of feeds. The feed-lot operation for cattle is not in practice yet and only a few firms buy surplus exotic calves for meat production. There is also only one newly-established feed lot with an animal capacity of up to 15,000 head of native cattle in operation in Centeral Ostan.

Meat Complexes

Government-affiliated agencies have recently started meat production on a big scale, involved in meat slaughterhouses and by-product proc-

essing factories. Meat production under meat complexes such as the Fars Meat Complex in the province of Fars or Maghan in Azarbaiejon are in the form of a feed-lot operation. Meat production under the present price system (meat prices and feed costs) is not economically feasible.[1] Other projected complexes are still under construction and there will be no statistics on their economic performance until their operation commences.[2]

Technological Aspects of the Livestock Industry in Iran

Factors affecting the supply of meat from a given animal population are the age and weight at slaughter time and the ratio of slaughtering to the total population. Furthermore, other technical factors in livestock production are breeding rates and losses due to diseases or insufficient feed.

The ratio of slaughtered animals to the total population of animals shows the efficiency of meat production and technological advancement. Countries with a high level of efficiency also have a high ratio of slaughtered animals. Given the same slaughtered weight, a high culling rate represents better efficiency in meat production. A forty per cent culling rate for cattle in European countries indicates an average for each cattle to stay 2.5 years on the farm.

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[1]The Fars meat complex, the first of this series started the meat production with a capital of 1,500 million rials. It consists of 15 packing and food processing plants and with 15 hectares of apple trees under project, it is designed to be a profitable firm.

[2]Including the Moghan complex with 5000 million rials, the Ziaron meat complex with 1,000 million rials.

Since cattle and sheep produce more than one product, slaughter rates depend mainly on the "purpose of raising animals." Cattle are used for three purposes: as draft, milk and meat animals. Sheep, on the other hand, are raised for meat and wool production and to a lesser degree for milk production.

In Iran, based on FAO (31) data, the culling rate for cattle averages 12 per cent; for sheep, 23.5 per cent; and for goats, 25 per cent.[1] Similar figures for the U.S. cattle and sheep are 32.5 and 54.6 per cent, respectively. The low ratio of slaughtered animals in Iran would clearly indicate that Iranian cattle are not raised chiefly for meat prodcution. Traditional farming in Iran required the use of draft animals as essential to the agricultural system. The analysis of slaughtered cattle in the Tehran slaughterhouse (85) showed that 50 per cent of cattle are over 5 years old. The transformation from the traditional to the modern system of agricultural production, with the substitution of farm machinery instead of animals, has caused draft animals to become redundant and, as a result, the culling rate has increased in recent years.

Animals for milk or wool production are usually kept for a longer period of time in comparison with animals for meat production. On the other hand, the taste and preference of consumers for veal and lamb in Europe and Middle Eastern countries would increase the percentage of slaughtered animals in the total livestock population. This will also be reflected in higher prices for younger animals. From another point

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[1] Bookers and Hunting Ltd. (22) used a 15, 20 and 24 per cent of off-take for cattle, sheep and goats.

of view, the extensive type of meat production requires a longer period of time to achieve a certain level of weight than does the intensive production system. Therefore, there is a lower slaughter rate in countries with the extensive type of production. Table 26 shows the average meat production per head in several countries with different systems of production in comparison with that of Iran. The major difference here is in beef production where Iran produced 13.61 kg per head against 87.22 and 42.07 kg for the U.S. and Argentina respectively.

Technological development makes a shorter time necessary to produce meat from animals. Due to lack of data on the number of livestock and the culling rate, one cannot give a definite idea of the trends of off-take ratio in Iran with regard to greater demand at the present time. Meat consumption in Iran, however, and the purpose of raising animals is changing toward more meat production. One major potential of increasing meat production in Iran is to increase the weight of slaughtered animals. In particular, cattle weight per head is very light in comparison with weights in other countries. An increase in cattle weight could increase meat production substantially.

Of course, under the present range or pasture system of production, the animals' weight cannot increase very much. Feed-lot system of production is required to intensify meat production per head. The only commercial feed-lot with native cattle under operation (Magshall Company) has shown the technical and economic possibility for increasing meat production.[1]

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[1]There are several other feedlots operating to some degree, mainly for exotic calf-fattening in the Tehran area.

Table 26. Average meat production per head animals (in kg)

Country	Mutton and Goat meat	Beef and Veal
Argentina	3.18	42.07
Australia	5.98	42.56
West Germany	13.44	84.54
United States	12.37	87.22
Iran	5.55	13.61

[a]Calculated based on 1972 FAO Production Yearbook statistics.

Breeding Type

According to the climate variation and feed availability of a place, the type of breeding animals changes in Iran from one place to another. Iranian sheep, their weights, sizes and colors have adjusted through natural selection to the place of production over a long period of time. Generally, there are two breeds of sheep found in Iran, fat-tailed, and thin-tailed sheep. The zel, the only naturally thin sheep in Iran, are found in the northern part of the country,[1] probably the smallest breed (30 kg) and in all colors with poor wool quality. The other type of sheep bred are fat-tailed and their weight varies from 25 kg (Sangesary) to 90 kg (Sanjabi). Most sheep have high resistance to lack of feed and water. Some of them have the finest wool, skin or milking production. Tribal sheep are mostly large with bodies suitable for traveling long distances. In addition to Iranian sheep, there has been some attempts to cross-breed Iranian sheep with some exotic breeds in order to improve wool or milk production, but these have not been successful for adoption by Iranians, due to disease or climatic consitions.

Lambing rates are also varied among Iranian sheep. The breeding rate depends on food conditions and genetic make-up. The average breeding rate for sheep in Iran is estimated at around 70 per cent, of which only 5-10 per cent are twins. This is one area of potential improvement in meat production. Experience with some Iranian breeds has shown that there could be as much as 50 per cent twinning and up to 95 per cent

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[1] The northern part of the country along the Caspian Sea has the highest rainfall in Iran.

lambing (28). Moreover, sheep in Iran are able to lamb more than once a year. Lambing in Iran is either in spring or fall, and it could be potentially economically wise to adopt techniques which would increase lamb production substantially.

Although there are many potentials for livestock development in Iran, one has to recognize that all improvements in productivity are more or less related to feed adequacy. Nutrition and reproduction correlate highly (84) and ewes in good condition have better lambing rates compared to ewes with poor nutrition. Therefore, in order to overcome problems of low lambing or under-weight animals, the feed supply must be improved.

Cattle in Iran are also found in different sizes and weights. Dairy cows in Iran are not good milk producers, and imported cows, mainly Holsteins, produce much more milk than native Iranian cows (4,800 kg vs. 750 kg). However, there are very good native cattle (Sistani) which are highly competitive with Holstein cattle in meat production.

Poultry breeds in villages are the Iranian native with low productivity which in recent years have substantially reduced in size (around 14 million . Commercial firms are using high producing broilers and layers, (Anak, Royal) in their production. The production of exotic poultry breeds is expanding very fast in the last decade, while that of native breeds are being reduced.

Disease and Death Rate

The high rate of loss among sheep and goats in Iran has been recog-

nized for a long time. Losses have been reported as high as 50 per cent among Iranian flocks in some years (46). Lamb losses are also relatively higher in Iran in comparison with other countries. As mentioned above, in Iran most losses are related to feed inadequacies, but the lack of veterinarians and animal disease control in many parts of the country are also responsible for the death of animals.

A survey taken by the author on various parts of the country showed that only a few livestock producers have access to veterinarians and most in remote areas have never had the chance to be visited by any veterinarians. There have been some epidemics among livestock in Iran which caused a severe loss of animals in some years.

Feed Resources

The most important factor in livestock production is feed resources. With a given number of livestock, feed is the limiting factor for production. There are several categories for feedstuffs discussed in this chapter. In one broad classification, feed resources are divided into two major categories, forage and feed-grain. Forage includes range production, pasture grass and all grown vegetables such as alfalfa, clover and the residue of feed-grain such as straw. Feed-grains are chiefly constituted of barley and corn, which are also called coarse grains.

Livestock development in the world has been in the direction of using more feed grain in animal protein production. These grains also are suitable for human consumption. Of the total world protein consumption only 30 million tons or 25 per cent come from animal protein (71).

More than 60 per cent of these animals consumed are produced from pasture and rangelands that are not useful in food production. The remaining 40 per cent have been produced on a ration of 4 kg of food suitable for man to 1 kg of animal protein.

Some animals such as poultry and swine consume more food suitable for human consumption. If in the United States there were a change to feeding animals only grass rather than feed-grain, animal protein production would decline by two-thirds from six to an estimated two million metric tons (71).

From an economic point of view, the production function for meat or milk has an usual concave isoquant with rigid lines which represent substitution between forage and concentration. On one extreme, one can produce with a little grain and more forage and on the other extreme with higher amounts of grain and a little forage.[1] Higher roughage rations require more days of animal maintenance to produce a certain amount of growth than do high-concentrated rations for growth and even at higher grain prices, meat production is more profitable with the grain than with the forage in the U.S. (24).

In developed countries, a large portion of grain is fed to animals. In the U.S., for example, only 18 per cent of the grain raised was consumed by humans in 1962. On the other hand, in developing countries most of the grain consumption is used for human consumption. Income demand elasticities of per capita grain for human consumption is -.17

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[1] In the United States animal production starts with a ration of low grain, then a higher forage and finishes with small amounts of forage and a larger amount of concentrate.

in developed countries in comparison with 2.0 in developing countries. Therefore, it can be concluded that the higher demand for meat requires a higher demand for feed and as a process of livestock production development, intensification becomes an essential part of the livestock production with range limitations.[1]

Feed Resources in Iran

The most important feed resource in Iran is range grass. The ranges are spread out all over the country and it is estimated that they cover an area as large as 100 million hectares. Only 25 per cent of ranges are categorized as "good" or useable, producing an average of 150 to 450 kg dry grass. The FMC estimation is different from that of the Ministry of Agriculture and Natural Resources. Table 27 shows the estimation given by the FMC (32) which is 30 million hectares, less than in previous reports.

Table 27. Estimated range area and production (in thousand hectares)

	Type of grass	Area	Required hectare per sheep unit[a]
Class I	herbaceous range	10,164	2.5
Class II	shrub and scrube range	33,674	5.0
Class III	low quality	24,928	100.0
Total		70,766	

[a]Sheep unit includes one mature ewe and her following.

[1]FAO projections for 1980 feed demand indicated that the greatest increase in meat-grain ratios will be among developing countries rather than developed countries.

This given estimate puts the potential at 11.4 million sheep units, which represents only 29 per cent of the overall numbers. If other studies are incorporated with these figures in which 80 to 85 per cent of animal feeds are range resources, it become clear that most animals in Iran are half-starving and are substantially undernourished.[1] Only 5-7 per cent of the total animals slaughtered had supplemental feed (2). Over-grazing has been mentioned by various studies. Bookers and Hunting Ltd. (22) estimated more than three times over-grazing by animals on optimum range capacity in 1975.

In general, it can be conlcuded that in the last decade there has been over-grazing on many ranges in Iran. The extent of over-grazing varies from one estimate to another. Since range production depends on rainfall, in dry years, range production is reduced substantially, leading to under estimation of range capacity. Estimations of over-capacity of animals varies from six (97) to two times (2). Last year's rainfall, for example, showed that most ranges are not totally depleted and could be productive again under good weather or less grazing in a few years.

As many countries have experience, range production can be increased greatly by applying fertilizer, seeds and some artificial rain. Australia, Argentina, and New Zealand have had a great success in improving pastures by better management and techniques of production. Other feed sources for animals are cereal grazing, arable land which contribute 28.8 and 41.9 per cent of feed resources. In addition to these,

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[1] Bank Markazi Iran reports that ranges are adequate for only 58 per cent of animal stocks in Iran in 1971.

range lands and other grazing contribute 20.1 and 9.2 respectively in which NCP (22) estimated are enough only for 49 per cent of the stock.

Feed Grain

Except for barley and small amounts of corn production, there has been no other major source of feed-grain in Iran.[1] Barley production is usually competitive with wheat production. Since barley needs less water, marginal land is used for barley cultivation. More than 75 per cent of the land under barley cultivation in 1971 was unirrigated land. Barley production decreased on the average of 5 per cent during the period of 1970-74, while at the same time barley production declined from 1,080 to 863 thousand tons.

As a result of livestock development in Iran in recent years, in particular poultry and dairy industries, the demand for feed-grain has increased rapidly. Consequently, imports of feed-grain have increased to compensate for inadequate domestic production. Imports of feed grain increased from 11.6 to 408.4 thousand tons from 1970-74 (see Table 28).

Table 28. Imports of major feed-grain in 1970-75 (in thousand metric tons)

	1970	1971	1972	1973	1974	1975
Barley	.1	191.9	23.1	107.5	178.5	203.9
Corn	11.6	62.4	70.4	130.8	229.9	146.9
Total	11.7	254.3	93.5	238.3	408.4	350.8

[a]Sources: Bank Markazi Iran (13) (14).

[1]Other feed-grain production in 1972 (corn, sorghum, etc.) is reported at only 54 thousand tons.

Per capita consumption of feed-grain in Iran has increased slightly, with the average per capita consumption in the last five years at 40 kg, which is substantially below that of many other countries. On the average in 1974, 2.4 kg of feed grain was used for one kg of meat production.[1] Similar figures for developed and developing countries are 1.5 and 6.5 respectively. Such a major difference will reflect a potential capacity for improvement in livestock techniques and more meat production from a given number of livestock.

Fodder Crops

Fodder crops cultivation accounts only for 6.2 per cent of irrigated land in Iran in 1973. Fodder crop production has increased by a small amount in recent years. the only statistics which are available are for the 1972 and 1973 agricultural census which shows a small decline in fodder crop production (see Table 29). However, other evidence from rapid expansion of commercial dairies and feedlots suggest some increase in production.

In general, land under feed-grain and fodder crops must be viewed from water resource allocation among various uses. Fodder crops in this regard compete with cotton and sugar beet production. Although water has been mentioned as a limiting factor in agricultural development, at least one study mentioned human resources, i.e. "skilled and semi-skilled" as the limiting factor, with neither water nor land considered as limited resources (22).

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[1] Milk and other by-products also must be considered for feed consumption.

Land resource allocation between human consumption and feed consumption depends on relative prices, water sufficiency, farmers' preferences, access to market, and in particular the national policy of government. In many instances, the lack of one of the above-mentioned factors can seriously hamper feed development in the future. Most feed producers are also feed consumers, hence, there is not much feed surplus to offer on the market. Usually, cash-crop producers have a secure market and knowledge of production techniques not yet in existence for fodder crop producers. The Iranian farmers' first priority for food production crops in particular for wheat production, has been confirmed by some studies (36). Therefore, it seems that profit maximization is not the only objective which farmers are interested in, the insecurity of food availability and the conservative nature of farmers in adopting new techniques place feed production development in an adverse position as opposed to other established crops.

Therefore, any feed development plans in Iran need many more incentives, extension services, and market guarantees, in addition to water and land availability.

Although in many cases fodder crops such as alfalfa have profit per hectare more than three times that of wheat, nevertheless wheat cultivation is more profitable in Iran since its profit per unit of irrigation is likely to be more than double that of alfalfa (60). It may be true that the feed value of alfalfa is five times more than barley per hectare, but barley might be preferred in relation to the scarce factor of production, water.[1]

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[1]The average profit per hectare for barley is 500 rials and for alfalfa, 16,960 rials (60).

Table 29. Area and production of fodder crops in Iran (1972-73)

Crop Production	1972		1973		
	Area under cultivation (ha)	Production 1000 ton	Area under cultivation (ha)	Production 1000 ton	Land as dry farming
Alfalfa (dry)	303,400	1,155	284,936	1,133	16,212
Clover (dry)	43,780	184	51,901	168	1,508
Other fodder crops	212,800	420	223,644	446	135,090
Total	559,980	1,763	559,481	1,747	152,810

[a]Source: Agricultural Census (80) (81).

Mechanization and application of fertilizer tend to decrease the cost of feed-grains per unit, but in many cases due to the size and unsuitability of land for tractors, and lack of access to a fertilizer market, it is not possible to change the present pattern. There is a direct relationship between yield per hectare and spending by farmers. In a study of the economics of fodder crop production in Iran (60), it was confirmed that there is a direct relationship between yield per hectare and spending for barley production; a similar relationship for alfalfa was not found. The reason probably goes back to the development of alfalfa production in Iran, which started with the use of high technology.[1]

Crop Residue and Other Feedstuffs in Iran

Probably, these sources of animal feed have contributed substantially to compensate for feed deficiency in Iran in recent years. Crop residues of any kind have been used for livestock feeding for a long time. Pasturing crops before and after harvesting, residue of crops such as straw, hulls and date seed and the residue of milled crops such as bran have substantial nutritional value for livestock.[2]

Additional feed sources which become known to livestock producers not long ago are residues of food processing factories. The most important in this category are sugar beet pulp and molasses, cotton

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[1] Alfalfa and other fodder crops constitute only a small plot of the total of each farmers' cultivation lands.

[2] See Appendix D for details of Iranian feed resources and their nutritional value and probably availability for livestock.

seed cake and other vegetable cake and residues of other food processing factories. Sugar beet pulp, a major by-product of sugar factories was utilized in small amounts domestically and later became a source of income through exports to other countries (see Table 30). As domestic demand for a cheap source of feed increased, the authorities stopped exports of beet pulp in 1973. Now, the demand is increasing faster than the supply, and as a result the price has to go up or there will be rationing by the authorities in the very near future. Cotton seed cake has gone through the same process, and as livestock producers became acquainted with this source of feed, demand by far exceeded supply. Iran is already importing some cotton seed cake from Afghanistan.

As food processing and preservation develop, there will be some feed available as by-products, but except for vegetable oil processing factories, the contributions of others to livestock feeding will be small. The estimated feed residues in Iran in 1975 are: 280,000 tons of sugar beet pulp (dry), 48,000 tons, and wheat bran is 440,000 tons.

Straw as a major by-product of crops in Iran provides over 80 per cent of the total estimated supplementary roughage for livestock (O-Donovan 1971), with wheat straw alone constituting over 50 per cent of the total. Native stock has an ability inherently superior to that of exotic animals in utilizing diets containing different percentages of low quality roughage.

New Prospects

One major problem in feedlot operations in Iran is the higher cost of feeds which make them economically impossible under present price

Table 30. Exports of feed residue

Items	1972 Quantity ton	1972 Value rials	1973 Quantity ton	1973 Value rials
Bran	---	---	75	334,708
Beet pulp	79,680	329,122,000	89,166	479,502,216
cane pulp			1,350	3,829,770
Vegetable oil residue	31,928	206,931,000	23,848	213,143,413
Other food residue	22,300[b]	40,094,000	103	798,499
Total	133,908	376,147,000	114,636	697,746,073

[a]Source: Foreign Trade Statistics of Iran (33) (34).

[b]Molasses.

system. The scarcity of feed resources, even at higher meat prices, discussed above, places strong constraints on the development of the livestock industry in Iran. One new technique in livestock feed development is the possibility of "waste recycling" in feedlot operations, which could reduce feed requirements and make the feedlot operation economical in Iran. Studies on poultry manure has shown that dehydrated poultry manure contains 10 per cent protein and a significant level of phosphorous which could contribute substantially to feed rations (28).

In Iran, wastes of animals are used as fertilizer and a heating source in villages. Animals produce approximately 50 per cent waste from feed eaten, and economic studies of waste-handling in the U.S. in the form of plant fertilizer indicate that the cost of handling waste does not justify its nutrient value (58).

Cattle and sheep which are fed poultry manure have exhibited no adverse affects in milk or meat production or harmful affects on their health. The recycling of animal wastes can contribute substantially to commercial livestock development in Iran and to reducing feed production scarcity.

The evaluation of feeds in Iran shows that in some cases livestock producers are not aware of feed quality and in many cases a better balanced ration can be obtained by using available feeds. The classification of feeds based on digestible protein (DP) and total digestible nutrition(TDN), which has been used in many studies, implies the optimum use of feed based on nutritional quality and does not always correspond to present practices. However, this technique of rationing will promise a substantial improvement in the future in feed/meat ratio.

CHAPTER VII. NATIONAL GOALS AND NATIONAL PROGRAMS IMPINGING ON THE IRANIAN LIVESTOCK-MEAT INDUSTRY

There is a significant role for national policy in production and trade of a country. The agricultural sector is the largest sector in terms of employment in Iran and therefore government intervention and investment, if successful, would benefit many people. Any government intervention and diversion of investment to agriculture beyond the optimum will result in the reduction of market values of private good in the future. Other goals than the GNP have become important and government intervention to pursue these goals have been a common practice in many countries around the world. Barker and Hayami (15) in the case of the Philippines even conclude that loss of private goods is not necessary in all cases as one pursues income distribtuion, environment and other goals.

In developing countries food self-sufficiency has been mentioned as a frequent goal of decision-makers. Moreover, in order to control inflation and bring in more foreign exhcange, many different policies in the agricultural sector have been implemented.

In Iran, the sluggish rate of growth and development in the livestock industry, and demand pressure on the other hand, increased imports and prices dramatically, causing government to become more concerned in the livestock sector in recent years. Prices for meat and dairy products increased relatively more than for other food items.

As a first reaction to higher prices of meat, administrated prices were used as an appropriate policy toward curbing inflation. Exports of livestock were forbidden, imports of livestock were occasionally permitted. Meat consumption was subsidised, and some small developmental

project were implemented. These short term policies could not solve the problems and only aggravated some problems for future years.

Long-run policies toward self-sufficiency in foodstuffs which call for investment in irrigation systems, research and development, institutions and infrastructural development such as electricity, roads, and communication, etc. due to limited resources were not pursued completely enough by planners. As a result, many short-term policies must continue at the present time. There is no alternatives for them for the time being and cost of these policies has become a burden to public funds.

A number of government agencies are involved in order to cope with problems in the livestock sectors. The Meat Organization, an affiliated agency, was established to regulate Tehran meat-market distribution, and their work later extended to Isfahan. The Pasture Development Fund was established to facilitate feed distribution among livestock producers. Also, the Agricultural Development Bank was established to extend credits; long term, medium and occasionally short term loans at low interest rates for agriculture and livestock development projects. There are several other large development agencies which have been established by direct or indirect investment of the government for meat and dairy production in Iran and other countries such as Australia and Sudan.[1]

Economic Evaluation of Government Policies

In order to evaluate the role of these agencies and their effective-

[1] A list of government agencies and their related activities is given in Appendix B.

ness in terms of self-sufficiency, price stablilization and benefits and costs of government intervention, one uses the conventional economic tools, demand and supply.

Figure 8 represents the present meat market in Tehran.[1] Equilibrium price, where the market would clear if there were no interference and all buyers and sellers competed freely in the market would be Pe which is substantially higher than the official price ceiling of Po. At Po demand by far exceeds the supply of meat at that price. Only OQ_1 is produced at Po price where the potential consumption at that price is OQ_3, a net Q_1Q_3 excess demand. The Meat Organization imports only Q_eQ_2 quantity of meat. The cost to the MO including transportation is higher than Po but imported meat is sold by MO at the official price of Po in the Tehran market. Therefore the imported amount plus domestic supply is less than the quantity demanded at the price of Po. There are two possibilities in such a disequilibrium. First, butchers may obey the official price, sell all their meat before all customers are satisfied with the resulting "shortage of meat." On a "first come, first serve" basis, available meat will disappear in a few hours. Secondly, there is a possibility that butchers will violate the official prices, a black market will result, and meat will sell at higher prices to special customers.[2] In a black market, the butchers who violate the price ceiling benefit financially and run a risk of punishment. Although government subsidizes meat consumption sub-

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[1]The reason that the Tehran mutton market was chosen is that it is the biggest livestock market in Iran and because changes in this market have substantial effects on all other markets in the country.

[2]Black market meat prices are sometimes 100 per cent more than prices. This could happen in two ways: selling low quality meat (frozen) at official prices to ordinary customers, or charging more for higher quality meat to special favorite customers.

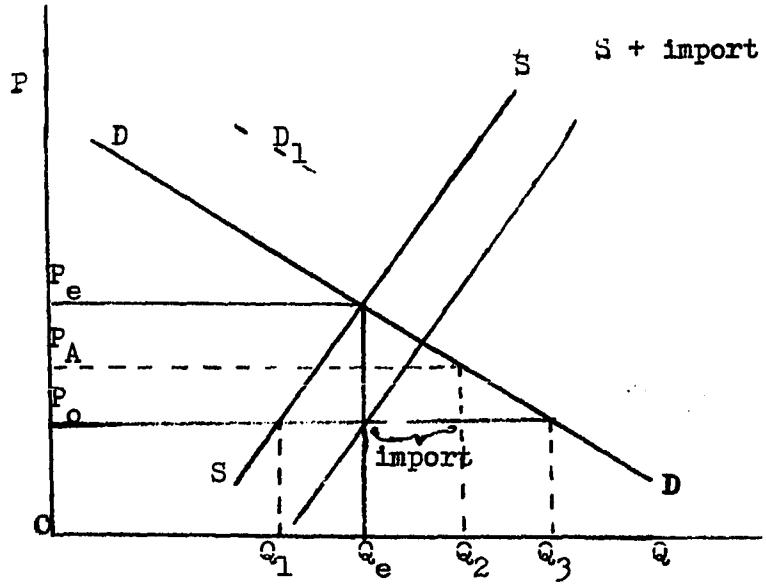

Figure 8. Demand and supply for meat in Tehran market.

who violate the price ceiling benefit financially and run a risk of punishment. Although government subsidizes meat consumption substantially, only a few customers actually receive all the meat they want at the ceiling price and hence, benefit from such a policy. Administration of a price ceiling is very difficult, if not impossible.

The low ceiling price to Tehran consumers causes the quantity of meat demand to be higher than the quantity which would be demanded at the equilibrium price. The price differences (Pe-Po) increase production by only Q_1Q_e. The small increase in the supply of meat in response to higher prices is due to the inelastic supply of meat. Although there is no accurate time-series data on the supply-price schedule, one can conclude from the feed resource estimation that the feed resource limitation makes the supply of meat, to some extent, inelastic. The price increase in recent years was much higher, relative to years before, but knowingly through municipal slaughterhouse statistics, production did not increase despite high prices.[1]

Nevertheless, price increases make economical the use of higher feed costs for animal husbandry and commercial feedlot operations. But commercial feedlot expansion requires substantial imports of either feed grain or cereal for human consumption; in case of devotion of more cultivated land to feed production.

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[1] In 1974, municipal slaughterhouses reported that the number of slaughtered animals decreased by 3.1 per cent with respect to the year before (74). Deducting 60 thousand tons of imported live animals, domestic production has decreased by more than 10 per cent from the year before. Statistics for slaughtered animals represent only cities with populations of over 5 thousand, and also do not include animals slaughtered outside municipalities. Unofficially slaughtered animals estimates account for 20 per cent of the total meat production.

are not high enough to equalize demand with supply. A price-policy increase is an unpopular one, and brings a higher inflation rate for the economy, which will have an effect on the rise in wages or the lowering of real income. This particularly has definite adverse effects on lower income families' welfare. Since the demand for meat increases at a much faster rate than does supply, either prices have to go up or imports (drying foreign exchange) do.

The alternative policy to meat subsidies is feed subsidies. In this case, since feeds constitute up to 85 per cent of meat production costs, the lower cost of feed could consequently change the supply schedule at the same price. Figure 9 represents demand and supply for meat in Tehran market, in which there exist some feed subsidies. Feed subsidies can be implemented through various policies: (1) Input subsidies to feed producers, such as fertilizers, credits and improved seed or irrigation equipment, and (2) Subsidies in the form of deficiency payments to farmers, i.e. higher fixed-prices for feed producers and lower feed-prices for livestock producers. The deficiency payments will be in the form of subsidizing the differences, and (3) Importing feed at higher prices and selling at lower prices to livestock producers. In a later policy, domestic feed producers will have no incentives to expand their production. At the present time, all three of the above-mentioned policies are practiced by government agencies.

In the first policy, the government will induce feed producers to use more modern techniques of production by increasing the use of machinery, better seeds and fertilizer at subsidized prices, thus expanding feed production and bring prices down.[1]

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[1]There is a potential for the divergency of some subsidized inputs to other crops production, if the inputs price differences are high and other crops prices are more attractive.

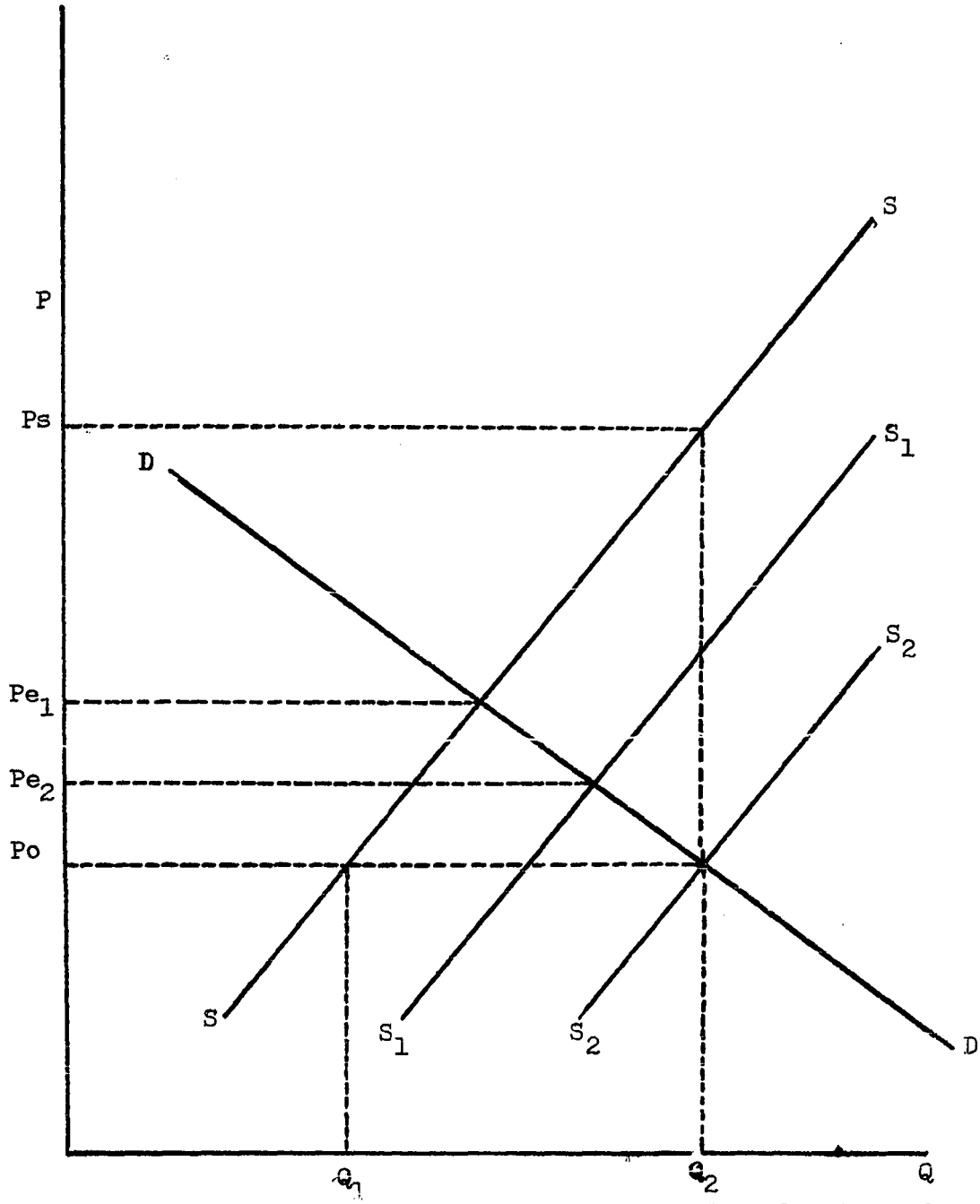

Figure 9. Effects of government policies on demand and supply for meat

The supply schedule will shift to the right (since the supply curve represents the marginal cost curve as well) and production will increase and meat prices will decrease. The extents to which supply will shift depend on many factors. These factors include adoptability of modern techniques by producers and profit margin changes as a result of cost reduction, so that resources can be devoted to feed crops (land, water, labor).

Approaching this from a different direction, one can analyze the inputs market (feed market) and output markets (meat market) separately. However, the end results will be the same. The factors market and production market are not separable, and demand for input in the factor market is a derived demand. Quantity of feed demanded and feed price depend on livestock or meat price and quantity consumed.

Feed Import Versus Meat Import Policy

As discussed above, limiting factors in the agriculture of Iran have caused the idea of self-sufficiency in all agricultural products in recent years to change to that of relative self-sufficiency in some or most of them. As indicated by some studies, the preference of decision-makers and planners in pursuing specific goals through rules, regulations, and public investment will determine (among other factors), which areas of production will have higher domestic increases.

In livestock development, there have been some discussions both

in favor and against imports of feed versus imports of meat in order to meet the domestic demand for meat. There are several factors which influence decisions on policies to give preference to one of the alternatives. Factors socially and economically important in this analysis are taste and preference of consumers, employment, foreign exchange, costs of meat and investment.

Taste and preference of consumers

Consumer preference for domestic meat production versus foreign meat has been observed clearly by many investigators. The Iranian preference for domestic fat-tailed mutton is a result of habit and religious background and attempts by authorities to sell imported frozen or chilled meat to consumers have failed to such extents that the prices were lowered by butchers in order to get rid of the imported meat. Although in certain circumstances, such as meat shortages in Tehran, even imported meat can find some consumers, one has to realize that in terms of grading, imported meat has been assumed by Iranians to be low quality meat. Therefore, in this case, importation of feed for meat production is preferred by consumers as a policy choice.

Employment

Feed imports require the establishment of new firms or expansion and improvement of present livestock husbandry in Iran. The pattern which is already known tends to more commercialization and intensification of livestock production in Iran, which requires substantial feed utilization and new techniques of production. Livestock development

creates new jobs and also utilizes the under-employed or seasonal labor surplus by combining livestock with farm activities. The importation of meat, on the other hand, does not create any jobs nor can it utilize underemployed farmers. Hence, one can argue in favor of feed imports against meat imports from the employment point of view.

Foreign Exchange

The foreign exchange burden is an important factor in the economic policy of a country. Even Iran with large foreign exchange earnings, must consider foreign exchange limitations in policy planning. Exhaustion of the oil resource in the long run must be taken into account for general agricultural policy planning. Policies which utilize less foreign exchange are preferred to policies using more foreign exchange. The value of feed imports for meat production depends on two factors: the price of feed grain in international markets and the productivity of domestic livestock, i.e. how much feed is required per unit of meat production. The productivity of animals depends on the genetic make-up of animals and also on the management of livestock production.

The expensive part of the meat production chain is the reproductive stage, i.e. calf or lamb production. Since many animals are undernourished, the potential weight increase is very high (200 kg potential versus 89 actual kg for native cattle). Imported feed grain could be used for the fattening stage which is the most efficient part (89).

Feed costs constitute around 80 per cent of the total costs in meat production. Also, in a fattening program, concentrates (usually feed grain) make up the bulk of the rations. The percentage of concentrate

in rations during the fattening program is much higher than in other stages (up to 85 per cent). A higher concentrate of ration, reduces the required time for meat production and increases conversion efficiency. In the reproductive stage, the amount of feed nutrition, as long as it meets the maintenance requirement, does not have any effect on reproductivity. Nonetheless, as pointed out above, it is possible to increase reproductivity through an increase in lambing twins and lambing twice a year, both requiring good management and nutrition.

Feed conversion varies among animals as well as among different breeds. The range of feed-meat conversion can be as high as 6:1 to 15:1. Based on experimental feedlot trials by various studies in Iran, feed conversion for sheep ranges from 19 to 5.68 and from 6.2 to 9.6 for cattle. The average feed to liveweight conversion are 12.7 and 8.09 for lambs and cattle respectively. The feed concentration in feedlot trials is reported as high as 82 per cent and as low as 40 per cent. Carcass weight, on the average, is 50 per cent of liveweight for lamb and cattle.

From the above-mentioned facts, for one kg of lamb and beef production, 7.6 and 4.8 kg feed consumption is required by animals. Forage and supplemental feed are not included in the figures.

Assuming corn imported from foreign countries as the main component of the ration for fattening (feed grain), for production of 1 kg lamb and beef based on 1974 imported prices, the foreign exchange portion of the feed cost will be as follows:

7.6 x 12.9 = 98.04 rials per kg of lamb
4.8 x 12.9 = 61.92 rials per kg of beef
3.2 x 12.9 = 41.28 rials per kg of poultry

The price of imported corn was exceptionally high in 1974. In previous years, imported corn prices were 5.8 and 9.0 rials per kg which were much cheaper than in 1974. Expected future feed prices, however, are declining or will be the same (42). Meat import prices for different types of meat are as follows:

price of imported low quality beef in 1974 - 107 kg/rls
price of imported mutton in 1974 ---------- 113 kg/rls
price of imported poultry in 1974 ---------- 53.7 kg/rls

The foreign exchange burden will be 45.1, 14.96 and 12.42 rials less for beef, lamb and poultry respectively. The most efficient meat in terms of foreign exchange is cattle fattening which gives the highest saving of foreign reserves. Cattle and sheep fattening do not require any other foreign exchange expenditures.

Costs of meat production

In addition to feed grain, forage and some supplemental feed is required. The fixed cost of fattening operation is usually assumed to be 25 per cent of the total costs. In studies of sheep fattening in Iran (61) non-feed costs (deducting income from manure and wool) constitute only 22.5 per cent which includes labor, stable, water, medicine, transportation, and marketing cost. Taking into account all non-feed costs, meat production costs will be as follows:

Cost items	Sheep	Cattle	Poultry (rls/kg)
1. Feed grain cost & transportation cost	105.56	66.7	44.5
2. Non-feed grain	2.5	16.0	10.0
3. Non-feed costs	34.0	20.0	15.0
4. Total	164.56	102.7	69.5
5. 10 per cent return added	16.4	10.2	6.9
6. Total costs rls/kg	181.0	112.9	76.4

Imported meat must be transported from port of entry by refrigerated truck or railroad to the consumer area, adding additional costs. Therefore, frozen meat imports cost per kg will be as follows:

(rls/kg)	Beef	Mutton	Poultry
1. Cost of imported frozen meat	107	113	53.7
2. Transportation costs	12	12	12
3. Total imported costs	119	125	65.7
4. Cost of cooled mutton imports		163	

A comparison of imported frozen meat costs with meat produced by fattening shows only domestic beef production cost is less than imported beef. The major negative difference exists between imported frozen mutton at 125 and mutton produced domestically at 181, with a difference of 55 rials or 45 per cent higher for domestic. When compared with the cost of imported cooled mutton, however, the difference is only 18 rials or 11 per cent more expensive. The poultry produced domestically is competitive with imported frozen chickens which may be subsidized by the exporting countries. The difference between the cost of imported chicken and domestic production is 10.7 rials or 16.2 per cent more expensive for domestic.

Taking into consideration the attitude of consumers toward imported meat as inferior to domestic production and subsidization by the exporting countries for the time being, the cost differences are not very great. The calculation is based on the cost fattening of livestock with imported grain, and it does not consider total feedlot operation.

In this analysis it is assumed that there are no subsidies by the government in terms of feed grain, as practiced at the present time. If feed subsidies are considered, the total cost of meat will be reduced by 33.4, 21.1 and 14.1 rials per kg for mutton, beef and chicken, re-

spectively. The costs per kg of mutton, beef, and chicken will be 147.6, 91.8 and 62.3, which (except for mutton) are cheaper than for imported meat. Even mutton when compared with imported cooled mutton, is cheaper in addition to being preferred by customers.

The fattening of livestock does not require large capital investment, with the major capital requirement being operation costs for animals and feed. With favorable and stable prices, the feedlot operation for fattening is a good opportunity for meeting some of the deficits in a short time. Bookers in the National Cropping Plan stated that since the value added in meat production is not significant, the importation of meat is a better policy than is the importation of feed (22). Although the beginning of the statement is true, the latter part needs closer examination. As long as meat production added some value and employs resources, one can argue in favor of the project, unless there are other opportunities greater than those which exist for investment. Also, the value added is not the only objective of the planners, and there are other considerations previously mentioned which must be examined in a general economic framework and for the welfare of the country.

One can conclude from the above discussion on employment, foreign exchange burden and consumer taste that the feed imports for chicken, beef and mutton production at the present price system is more preferred than meat import per se. However, from the standpoint of production, cost of meat (imported frozen mutton) will cost less than the mutton produced through domestic fattening. The exceptions are high quality imported mutton and beef which cost higher or the same as domestic production.

CHAPTER VIII. LINEAR PROGRAMMING SIMULATION OF THE MEAT SUPPLY ALTERNATIVES IN TEHRAN OSTAN

Regional Characteristics

Centeral (Tehran Ostan) is the most populous province in Iran. Tehran Ostan's population was estimated at 6,580 thousand in 1974, and is growing at 3.7 per cent annually. The density of population is 71 people per square km. The total area in this Ostan is 91,519 square kms, of which the cultivated area accounts for 42 per cent or 386,420 hectares of the total land at present.

The limiting factors for land utilization are the high salinity of soil in the southeast (desert area), and the scarcity of water. From the north to the south, and from the west to the east in Centeral Ostan, water consumption for crops is increasing, but rainfall is decreasing. Annual rainfall in Tehran averages 235 mm, while in the southern part, Saveh and Ghom, precipitation amounts are 158 and 129 mm, respectively. Evaporation in the northwestern part is 1653 mm, whereas in the southeastern area it is 2919 mm. Therefore, there is a need for more irrigation in the southern part of the province, in comparison in other areas (see enclosed map for location of Tehran Ostan). High mountains and valleys in the north and northeastern parts of the province constitute the spring and summer rangelands, and flat areas in the southern part are good for fall and winter grazing of animals.

In 1971, 47.1 per cent of Tehran Ostan's active population were engaged in agriculture, 27.6 in industry, and 25.3 in services. Population growth averages an estimated 3.7 per cent per year, and rural

population has been stable since 1966. However, the percentage of rural population to the total population decreased from 29.6 per cent to 27 per cent from 1966 to 1971 (75).

Tehran, the capital and largest city of Iran, is located in this Ostan. The population of Tehran was estimated at 3.9 million in 1973, with an annual growth of 6.1 per cent, mainly due to migration from rural areas and other cities (82).

Tehran Ostan is also the center of the major industrial and economic activity of Iran. Based on 1972 estimates, 30 per cent of the factories, 37 per cent of the industrial labor force, 58 per cent of the sales value, and 62 per cent of the value added in industry are located in Tehran Ostan (82). Tehran's per capita income is estimated at 2.4 times more than the average income per capita of the whole country.

There has been much attention from the public as well as private sector to agricultural development in this province. In 1972, the Ministry of Agriculture and Natural Resources and the Ministry of Cooperatives and Rural Affairs spent 9 dollars per hectare of cultivated land and 17 dollars per family in Tehran Ostan, a larger investment for agricultural development in this province than these ministries have made in any other province (56).

Livestock Industry in Tehran Ostan

Demand for livestock products in Tehran Ostan increased faster in comparison with other provinces. However, in spite of the higher demand for meat per capita, meat consumption declined in Tehran from 25.8 in 1959 to 18.7 kg in 1967 (72).

Tehran's vast market for meat and livestock products has attracted much private investment in this area. In addition to the activities of traditional livestock producers (villages and nomads) in this province, commercial poultry and dairy productions have developed rapidly in the last 15 years. Modern, large-scale, capital-intensive poultry as well as less capital-intensive and medium-sized firms expanded poultry production at such a rate that poultry prices decreased in the early 1960's due to excess supply.

Although during the early years of the development of commercial poultry production many unexperienced producers dropped from the market due to disease and price fluctuations, the most efficient and skilled producers continued their operations and poultry numbers increased from 22.3 to 62.3 million in the period of 1965-74. Almost 50 per cent of the commercial poultry producers are in Tehran Ostan. Except for limited importation of eggs for chicken production, and one-day chicken, no substantial chicken or eggs imports were reported until 1975. Poultry producers are using modern techniques of production and are competitive in efficiency with any other poultry producers in other countries.

Commercial Dairy Producers

With the expansion of the Tehran population and a higher demand for milk and dairy products, in recent years traditional dairy producers with inefficient native cows switched to efficient modern dairies with efficient exotic cows. With the establishment of two-bottle milking factories in Tehran, dairy producers were encouraged to develop their dairies and use more modern techniques of production and sanitary equip-

ment. Appendix C, page 232 shows the distribution of commercial exotic and cross-bred dairy cattle in Iran in 1975. Commercial dairies in the Tehran area and Tehran Ostan held 70 and 45 per cent of the total commercial dairies with exotic or cross-bred stocks in Iran.[1]

Approximately 80 per cent of the dairy cows in Tehran area are native cows which produce 30 per cent of the milk production in this area. They are not efficient in milk production and in a report on dairy activities in Tehran (35), a FAO specialist found that most of these dairies are losing money. Commercial dairies around Tehran have relatively small production, on the average of 54 per cent of the dairies are small, having 1-50 cows; 40 per cent have 50-300 cows; and only 6 per cent have more than 300 cows.

Feedlot Operation

There are some sheep-fattening operations in Tehran Ostan whose activities start in late fall and operate for not more than 120 days. Except for some exotic calf-feeding activities, there is only one modern cattle feeding (using native steers) which exists in the Ghazvin area.

The populations of Tehran Ostan's cattle, sheep and goats were estimated in 1973 at 339, 2,453 and 944 thousand heads respectively. The number of totally migratory flocks was estimated to be 250,000 head which migrate from the mountain area in the north to "Dashte Varamin" in the southern part of Ostan during the winter. The number of

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[1]The exotic dairy cows in Iran are mostly Holstein or Brown Swiss which were imported from the United States, Israel, and the Netherlands.

poultry in Tehran Ostan is estimated at 30 million, which are mostly commercialized, and their number is increasing very rapidly. Commercial poultry firms are generally efficient in feed-meat production, however, there are variations in terms of scale of production, efficiency, and capital use (automation) among them.

Linear Programming Techniques

In order to study various problems of meat production in Centeral Ostan and allocation of feed resources among livestock activities, a linear mathematical model is developed to incorporate present technological aspects, resource endowments, with economic factors in the livestock industry in this region. Linear programming application, at the farm, region, and state levels is recognized and used for a variety of purposes. The greatest advantage of linear programming is its flexibility in dealing with changes in technology, prices and resources. Different types of policy or goals can be examined with regard to minimization of cost or profit maximization in the framework of linear programming techniques. Market structure, scale of production and various effects of restriction at the farm or regional levels can be measured and their impacts can be expressed on the local level.

Alternative methods of meat production and competition of animals for limited resources can be investigated with the help of linear programming methods. The objectives of this study are to investigate the effects of various factors in the supply of meat products in this region. The supply response to various agricultural policies and regional demand is analyzed with regard to different objectives simultaneously. Demand

variation among different commodities by substitution through per capita consumption can be reflected in regional demands and incorporated into the linear programming model.

Although the ability of the linear programming method to embody different functions makes it an excellent tool in evaluating agricultural policy, one also has to recognize the limits of linear programming. One major difficulty in using linear programming is that it regards all production possibilities with constant marginal products. Hence, it does not reflect decreasing or increasing costs, based on the production function or scale of production. Constant costs in the objective function, simulate a perfectly elastic supply curve for the production and also elastic demand curves for the resources. Therefore, linear programming represents a constant cost production function system rather than a variable one.

One way to overcome these problems in a regional study is stratifications of activities into different groups with different levels of cost. Also, appropriate restrictions must be imposed in order to bring an activity in line with reality and to avoid domination of one activity over others. Representative activities in a region can reflect different scales of production, management, capital, techniques of production, and also cost of operation. It must be borne in mind that the linear programming method, as is any other quantitative-simulating system, is reliable in projections as long as input data and restrictions are accurate. Therefore, input data and model specification play a significant role in the usefulness of output in policy formulation.

Presentation of the Model

A linear programming model formulated in matrix form for Centeral Ostan livestock industry follows: Maximize $Z = C'X$

subject to the restrictions: $A_1X \leqslant S$

$A_2X \geqslant D$

$S \geqslant 0$

Where: Z is the objective function;

C' is a 1 x n vector of livestock activity net prices;[1]

X is an n x 1 vector of livestock activity levels;

A_1 is an m x n matrix of input-output coefficents;

A_2 is an m x n matrix of the livestock product output by livestock activities

S is an m x 1 vector of resource supplies

D is a vector of minimum livestock product demands to be met.

In order to avoid infeasibility in the planning model, some buying activities (imports) from other regions or international markets were added to the model. Farming and livestock-raising in most cases are separable activities, due to the nature of livestock husbandry in Iran, i.e. common ranges, nomadic tribes, and the small size of holdings. Livestock activities are therefore separated from farming without losing any accuracy (see Chapter IV on livestock ownerships).

In some cases, partial optimization is used to evaluate the changes in prices and resources, where some activities are required to be limited in regard to their nature or policy implementation.

In this model, the unit of activity is assumed to be one mature

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[1] Net prices are the value of wool, milk, eggs and manure provided by livestock less the costs of labor, capital and plus the value of livestock products produced.

ewe and her followers, one mature cow and her followers, and one thousand chickens. Therefore, one unit of activity in range-sheep production, for example, represents a population of 2.3 sheep and goats. The composition of the flock changes with the different seasons, rainfall amounts and owners' decisions.

Description of activities

Activities in the model are four sheep-raising activities, five cattle-producing activities, including two dairies, and two chicken-producing activities. The remaining activities are four labor-hiring activities in different seasons, buying activities, three capital-borrowing activities, including a foreign-exchange borrowing activity. Three meat-selling activities for each type of meat -- beef, sheep and chicken -- and three meat imports (buying) activities are also included in the model. Later, four more activities were introduced into the model: one chicken production activity, two cattle-feeding activities, and one sheep-fattening activity.[1]

The four sheep activities represent different types of sheep production in the regions. Activity P01 is sheep-raising activity on the range, P02 is sheep-raising in the village with some winter supplement, P03 is sheep-raising activity in the village with supplemental feed in winter and fattening of lambs and culled ewes, and P04 represents sheep activity totally in house confinement, without access to pasture or rangelands.

[1]Appendix A describes all activities, restraints and input-output coefficients in detail. In all sheep raising activities, activities P01-P03, a portion of flock assumed to be goats. However, for abbreviation in the text, sheep or mutton is used instead of sheep, goats or mutton, goat meat.

Cattle activities P05-P09, represent different levels of management as well as breed, and feed techniques. Activity P05 represents native-cow production, mainly fed on rangelands or pasture with some feed supplement. P06 is a commercial dairy activity with native breeds, which are totally hand fed. Activities P07 and P08 represent cattle-feeding activities with native steers imported from Azarbaiejan and Khorasan provinces, and P09 represents a modern commercial dairy industry with highly skilled management, using exotic or cross-bred cows, mostly Holsteins.

Commercial poultry production in Iran was begun only a short time ago and therefore most firms use modern techniques of production with relatively good management and they are more homogeneous in comparison with other livestock husbandry activities. Two commercial chicken activities P10 and P11 are broiler and layer which are very capital intensive activities. Later, another activity P37, a broiler activity with less capital investment was introduced to examine limitations on capital constraints.

Two cattle-feeding activities with indigenous steers from regional cattle production with P38 and P39 with different feed rations added to the model. A sheep-fattening activity from sheep produced in rangelands, P40, was introduced to study feed limitation and link between fattening activities and other activities as a supplementary activity.

Activities P12-P15 are 4-season labor-hiring activities, while P16-P25 and P32 are feed-buying, other than resources available in the region. Activities P27, P28 and P33 are capital-borrowing activities with P27 and P28 short-term (operational capital), and long-term capital

investment domestically, with P33 is capital-investment borrowing in terms of foreign exchange. In fact, there is no foreign exchange involved in borrowing, but the foreign exchange part of capital investmetn was separated (in terms of equipment and machines required) to investigate the foreign exchange policy objective.

Activities 29-31 are meat-selling activities, while activities P34-P36 are meat-purchasing activities, either by imports from other regions of foreign countries. Goat production was not introduced as a separate activity since goats and sheep are in the same flock and their numbers in flock depend on the feed resources and topography of the area. Therefore, sheep activities P01, P02, P03 also have some goats.

Description of resources

Feed resources available in the region in 1973 represented in the model are range production, aftermath and pasture production, feed resources produced in the region, and by-products of crops or residue of food-processing factories in the region. Other rows in the model are transfer rows and represent accounting data. The region's demand for meat in three separate rows accounts for sheep and goat meat, beef and veal, and poultry meat incorporated into the model as minimum restraints, based on meat consumption in 1972 for Centeral Ostan. Also, three different maximum levels of meat consumption (higher estimate) were chosen to allow exports in case of surplus.[1] The demand for milk and eggs (commercially) was included in the model. It is assumed that

[1]The Tehran market is deficient for all livestock products, therefore maximum demand requirements is only a precaution and are not intended to limit production.

sheep milk does not enter the commercial market. To limit some of the activities according to reality, some bounds were imposed on these activities. Labor and capital are not limited in the model. Sheep and goats milk produce in a limited period and due to problems of transportation and small amounts of production, it either is consumed by owners or neighbors or converted to yogurt or cheese. However, in calculating net income for activities, they were included as income.

Input-Output coefficients

The most difficult part of model building is the collection of accurate and reliable data and the conversion of data appropriate for the linear programming model. Figures on livestock production in particular are the most burdensome, due to the nature of production, immeasureability of some of the coefficients and the wide variation practiced among producers. Different breeds, climate and feed availability represent a wide range of production possibilities for meat production. This task becomes much more difficult in Iran where few technical, economic and social reports exist for the livestock industry.

Many studies in recent years simply use the technical coefficients common in other countries and ignored the differences in genetical and climatic conditions for the livestock industry in Iran. In order to overcome some of these problems, extensive interviews took place with livestock producers in the region during the course of the current investigation. Many technical reports in livestock were reviewed, and their results were compared to find the most suitable. In particular,

some of the livestock activities were introduced recently in the region and there has been no previous reports on these techniques of production. Furthermore, the performance of animals are different from one area to another due to climate and management skills.

There are two methods in constructing input-output coefficients (feed-meat) for livestock husbandry in linear programming tableau. One is to convert all resources to a common feed unit; the second is to use feed coefficients in actual terms. In the first instance, all animal nutritional requirements are determined in terms of common units which are comparable to the same units in the resource constraints. In this case, all nutritional requirements are expressed in the form of digestible protein (DP), total digestible nutrient (TDN) or net energy (NE) or common feed in livestock production such as barley or corn. The advantages of this method are substitutability among resources infinitely and efficiently, and competition of different breeds for all feed resources without any restrictions. The maximum efficiency in terms of input (nutritional value) and output will result in the solution.

The advantages of the second are possibility of price variation and limited substitutability among feed resources whcih restricts animals' competition for some feed resources. Therefore, this method takes into account inefficiency in terms of immobility of resources and the knowledge of producers in terms of the nutrient content of feeds.[1] Also,

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[1]In several studies on feed-ration practices in Iran, it has been confirmed that some livestock producers are convinced that a certain feed (barley) must be part of the ration, regardless of prices or nutritional value of other available resources (59) (61).

this method does not allow substitutability of resources which is practiced in many instances in case of scarcity or price changes. In order to solve this problem, one has to include as many activities as possible with different feed combinations to allow more flexibililities in resource substitution.

In this study, the second method was used to take advantage of price flexibility and also limited feed substitution, due to actual practice based on institutional and cultural characteristics of animal producers in the region. However, input-output data are approximate for representative activities, and do not correspond exactly with a particular activity even if it was mentioned as a source of data.

Prices

Prices used in the model are 1973-74 prices. The prices of meat sold are producer prices, whereas purchase prices are wholesale prices. Transportation costs were added for products which are imported from other regions or foreign countries; otherwise it is assumed that transportation costs do not constitute an important change in the price of products. However, it must be taken into account that the 1972-75 prices are much higher than those of previous years. But there is no indication that prices will be lowered in the future. Some of the imported prices which are used in the model are fixed by authorities, through subsidies or regulations, and are consequently lower than the market price. For example, imported corn or domestic production guaranteed price is 12,000 rials/ton which is higher than 9,500 rials/ton sold by Fodder Bank.

Interest rates and wages

For each season, different wage rates are assumed for the labor hiring. Winter wage rate is the lowest one, where farm activities reduce substantially and construction jobs decline due to weather. Interest rates are based on Agricultural Development Bank charge on loans borrowed from the bank for livestock investments which is lower than market and commercial banks.

Implication of the Model Under the Present Price System

The region can be self-sufficient (under the hypothetical model) in milk and eggs production. In particular eggs production exceeds the regional demand and can be exported to other regions. The region has a serious shortage in mutton production, and cannot produce more than 34 per cent of the mutton and goat meat consumption in the region. Beef production, on the other hand, can reach 59 per cent of consumption.

A major portion of the mutton and goat production comes from range production (44 per cent). Table 31 shows the meat production from different types of livestock husbandry in Tehran Ostan. Inclusion of house-confinement increased mutton production by 30.2 per cent. Sheep fattening added another 9.2 per cent to mutton production. Since the number of sheep for fattening is linked with the number of range sheep, sheep fattening cannot expand until range sheep husbandry increases. If sheep can be imported for fattening from other regions, then the limits will be on feed resources and capital requirement.

The beef production comes from three different sources: the fattening of imported cattle from outside regions; beef production from dairy

cattle as by-products of milk production; and partial range-cattle with fattening activity. Beef production from fattening of imported cattle constitute 90 per cent of beef supplied in the region where beef production from dairy cows does not exceed more than 10 per cent of the total production. Milk production can be met through commercial dairy production with exotic cows provided there are 10,633 units of dairy cows. Commercial dairies with native cows do not enter the solution. Egg production is so profitable that unless some maximum limits are imposed, it will dominate the poultry production activity totally.

Feed resources produced in the region are not sufficient for livestock feed requirement activities. Except for range and pasture production which cannot be purchased or transferred from other regions -- unless animals can be moved to ther other regions for grazing -- the region has surpluses only in straw and bran.[1] Other feed resources must be imported from other regions or foreign countries. Table 31 shows the feed imports, feed production in the region and total feed consumption.

The greatest shortage of feed resources appears to be in sugar beet pulp which, under the present feed rationing presented in the model and the restriction imposed on imports, can increase the value of the program more than any other feed resources by adding one more unit. The marginal value products or the shadow price for sugar beets is 61,495 rials/ton, which in comparison with purchasing price (4,000) is much higher and

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[1]Straw is used widely in construction and competes with livestock in consumption. Bran is a by-product of millers, and in regard to bread consumption in Tehran is in large supply.

shows the severe scarcity of sugar beet pulp resources. Alfalfa is the second most scarce feed resource restricted in the model. The shadow prices for range and pasture production are 2.1 and 4.9 rials per kg.

With the bounds imposed on imported cattle (P07 and P08 activities) the solutions in the linear programming model changes. Cattle on partial range production enter the solution, and village sheep production is eliminated. Mutton production decreases from 14,848 to 6,503 tons and beef production increases from 14,787 tons to 20,045 tons. Therefore, there is a trade-off between mutton-beef production in the region when partial-native cattle enter the program. Milk production from exotic cows which account for 100 per cent of demand decreases to 11 per cent in the new solution (see Table 32). No changes in the composition of poultry activities occur as a result of bounds. Imported cattle for fattening, constituting 90 per cent of beef production, decrease to 21.9 per cent and cattle fattening from the region range account for 13.6 per cent of beef production in the region.

Feed utilization composition also changes as the result of limits. Cotton seed, barley, and bran consumption increase to 97, 105, and 62 thousand tons. On the other hand, molasses, clover and sorghum consumption decrease substantially (see Tables 31 and 32).

Labor-hiring increases with a limit on imported cattle in all seasons, in particular winter and spring. Capital investment (long-term) and foreign exchange requirement decrease, while capital for operation costs increases. This is simply a trade-off between capital and labor in livestock production. Labor in livestock production can be substituted for capital as the solution in the programs' implications.

Table 31. Livestock production and feed requirements for Tehran Ostan

Production				Feed resources utilization				
Items	Unit	Meat (kg)	Percentage of total	Items	Import Buying (tons)	From region product (tons)	Total tons	Unutilized
Mutton and goat production				Alfalfa	50,000	164,000	214,000	
Range production	594,986	6,574,595	44	Cotton seed	21,077	15,097	36,104	
Village production	146,167	2,416,140	16.2	Barley	22,024	46,000	68,104	
Fattening	142,796	1,370,841	9.2	Corn	74,417	20,000	93,417	
House-confinement	156,873	4,486,567	30.2	Straw	----	100,134	100,134	64,537
Total mutton and goat	1,040,822	14,848,172	100	Molasses	2,948	3,617	6,568	
Beef production				Sugar beet	50,000	14,770	64,770	
Fattening	52,526	13,315,341	90	Bran	----	12,205	12,205	21,595
Dairy Cows (exotic)	10,633	1,471,607	10	Clover	----	7,308	7,308	10,592
Total beef	63,159	14,787,234	100	Sorghum	98,629	----	98,629	
Poultry Production				Wheat	39,486	----	39,486	
layers	1,785	1,454,775		Soybean	31,597	----	31,597	
broilers	26,732	41,434,600						
Milk production (exotic)	10,633	52,000,000						
Egg production	1,785	13,186,000						

Table 32. Livestock production and feed requirements for Tehran Ostan with limits on imported cattle

	Production			Feed resources utilization				
Items	Activities unit	Production kg	Percentage of total	Feed resources	From imports	From region production	Total feed utilization	Unutilized
Mutton and goat production		6,503,639	100	Alfalfa	50,000	164,000	214,000	
range production	426,567	4,713,565	72	Cotton seed	82,806	15,097	97,903	
village production	----			Barley	59,673	46,000	105,673	
Fattening	102,376	982,723	15	Corn	73,417	20,000	93,417	
House-Confinement	29,176	834,433	13	Straw	----	100,134	100,134	64,537
				Molasses	----	2,200	2,200	1,417
				Sugar beet	50,000	14,770	64,770	
Beef production		20,045,866	100	Bran	28,341	33,800	62,141	
partial range	202,066	7,777,231	38.8	Clover	----	----	----	17,900
Fattening (range)	60,602	2,719,211	13.5	Sorghum	10,401	----	10,401	
Dairy (native)	78,177	5,132,320	25.6	Wheat	39,486	----	39,486	
Dairy (exotic)	1,785	247,044	1.2	Soybean	31,597	----	31,597	
Fattening (imported)	20,000	4,383,000	21.9					

Milk production		52,000,000	
Exotic cows	1,785	8,728,650	11
Native cows	78,177	46,515,315	89
Poultry production			
Broiler	26,732	41,434,600	96
Layer	1,785	1,454,775	4
Egg production	1,785	13,186,000	100

Table 33. Livestock production and feed requirements for Tehran Ostan (no minimum demand)

Production				Feed resources utilization				
Items	Activities unit	Production kg	Percentage of total	Items	Imports buying (tons)	From region production (tons)	Total tons	Unutilized
Mutton and goat production		7,420,828	100	Alfalfa	----	164,000	164,000	
range production	426,567	4,713,565	63	Cotton seed	27,537	15,097	42,634	
village production	----	----		Barley	25,805	46,000	71,805	
Fattening	102,376	982,309	13	Corn	73,417	20,000	93,417	
House-confinement	150,295	1,724,437	24	Straw	----	112,461	112,461	106,578
				Molasses	----	----	----	3,617
Beef production		10,375,268	100	Sugar beet	10,396	14,770	10,396	
partial range	202,006	7,777,231	75					
Fattening (range)	60,602	2,598,007	25	Bran	----	30,332	30,332	3,267
				Clover	----	----	----	17,900
Milk production	----	----		Sorghum	----	----	----	
				Wheat	39,486	----	39,486	
Poultry production		42,890,000	100	soybean	31,597	----	31,597	
layers	1,785	1,517,250	4					
broilers	26,732	41,434,600	96					
Egg production	1,785	13,186,000	100					

The value of programs under minimum demand requirement for the region indicates a negative value. This implies that under the present price system and resource limitations, some of the livestock activities are not profitable and will not appear in the model they were required to be. In order to evaluate these activities, all minimum demand requirements are removed from the program. Under no minimum requirements, mutton production increases and beef production decreases. Mutton production increases to 7,420 tons from 6,503 tons and beef production decreases to 10,375 tons from 20,045 tons in the previous solution (see Table 33). One major change under the no minimum demand requirement was the elimination of commercial dairy activities with exotic cows in the program. No changes occur in poultry production or egg production.

The value of the program for the region became positive, and this shows that dairy activities are not competitive with other animals under the present price system and resource scarcity in the region. Other livestock activities in the region compete for feed resources, and dairy activities are the inferior activities relative to the others. Assuming sorghum, which is the main feed requirement for dairies with exotic cows, is produced in the region, dairy activities become part of the solution.[1] With different rations, dairy activities compete more for available resources in the region.

One can conclude that the region is deficit both in feed and meat production and due to limited cheap feed resources (cotton seed cake and

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[1]Sorghum in most dairies with exotic cows is the main feed and most of the feed is produced in the farms. However, in the last two years, sorghum imports have increased and compensate for the major deficit.

sugar beet pulp) expensive feed for fodder crop or grain production must increase which will result in higher costs of meat and milk production. Labor and capital are not limiting factors for beef and mutton production, but seriously can limit poultry and dairy production. Village and range sheep activities are competing with native cattle in feed resources and increase in one activity decreases the other's production.

Supply of Meat in Centeral (Tehran) Ostan

Lack of information about the producers' response to change in price and market development has made difficult a comprehensive planning program for agricultural products. Evaluation of supply schedule responses to various agricultural development programs is essential for agricultural economists in policy recommendations in regard to the volume of production, consumption and well-being of a society.

Programming with variable prices "parametric procedure" in linear programming, will furnish valuable information as to how the price changes might affect structure and composition of the representative activities. In a regional analysis, various activities which compete for limited resources such as land, water, labor and capital, can be evaluated in response to price changes.

Supply functions derived in linear programming are different from "usual" supply functions. In linear programming, we derive "normative supply" function, which implies that we assume producers maximize their income, or minimize their cost. This is different from the "positive

supply function," where it predicts how producers behave in case of price variation. Supply functions derived in this study, due to various restrictions on resources and institutions, are better expressed if called "conditional normative supply."

Normative supply schedules were derived for mutton, beef, poultry and milk production in the region. The supply functions are in the form of "stepped" supply, rather than "smooth" curves. The stepped-supply curve can be smoothed through least-squares regression equations or by drawing a line through mid-horizontal and vertical supply lines.

Since the region is a net deficit area in meat supply as well as in feed resources, imports of meat are permitted at 200, 180 and 120 rials for mutton, beef and chicken with no restraints on quantity. Only two constraints were imposed on feed imports. Sugar beet pulp and alfalfa imports from other regions were limited to 50 thousand tons. Other feed resources can be imported either from outside the region or from foreign countries. Feed-selling is permitted for feed produced in the region.

Normative Supply and Cross-Supply Functions for Mutton, Beef and Poultry

Normative supply and cross-supply functions are derived for mutton, beef and poultry under three different assumptions. First, it was assumed that the imported prices are always 10 rials higher than the selling price; second, that imported prices are fixed at the same level as before; and third, that all minimum demand requirements for livestock production in the region are dropped from the model. Under the import

price variation domestic production is less competitive with imported meat and one can examine the effect of international price changes in domestic production.

Three different normative supply functions are derived for mutton, beef, poultry and milk production.[1] Tables 34-40 and Figures 10-16 represent all three different supply functions for meat production. Supply elasticity and cross-supply elasticity were calculated for mutton and beef, and poultry. The cross-supply elasticity from the model for poultry with mutton and beef is zero, because in the model poultry production does not compete for feed resources with mutton or beef production.

Mutton supply functions

Under import price variation, mutton production starts at 50 rials per kg, reaching maximum supply at 220 rials. Even at that high price, the mutton supply does not exceed 38.7 per cent of the region's minimum demand (see Table 34). The small amounts of mutton supply at the low price of 50 rials comes from house-confinement. This is not very surprising, since the house-confinement activity does not compete with beef production activity for scarce resources as other sheep activities do.

Sheep-range activity starts at 70 rials, reaching maximum production at 220 rials per kg. Sheep fattening as a supplementary activity to range sheep production, following the same patterns. Village sheep

[1] Since poultry and milk production only derived under no-minimum demand requirement.

production activity (P02) does not appear in the solution, until the selling price reaches 210 rials per kg for mutton. The critical price-point for mutton supply is 220 rials where all resources pulling out from other livestock activities and utilized for mutton production.

The difference between the first, mutton supply schedule-import price variation, and the second, under fixed-import price (at 200 rials/kg), is that under the fixed-import price, mutton production starts at an even 10 rials/kg. This is an indication of opportunity cost differences which cause, at higher import prices, mutton activity to be possible. Mutton production under the fixed-import price is constant at 6962 tons at 10 rials per kg up to 190 rials. However, from that price level, the mutton supply schedule becomes the same under both the assumptions. The main point here is that, if import prices increase, production of mutton becomes more competitive in the region. Therefore, other regions and the international mutton market can influence alternative meat production in the region.

Under the no-minimum demand requirements, the supply schedule for mutton is different. Mutton production starts at 60 rials at low level quantity 345 tons, and maximum production does not exceed 15,306 tons at 180 rials. At the prices above, 180 rials supply of mutton is completely inelastic and further price increases cannot produce more mutton in the region.[1] This is 36 per cent of regional mutton requirements and less than production under minimum demand requirements.

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[1] In the short-run, price stimulation cannot increase supply after all transferable resources are transferred to mutton activities from other livestock activities. However, in the long-run competition for feed resources cause more land brought in for feed production from other types.

Supply and cross-supply elasticities for mutton and beef for prices around 1973-74 prices were derived.[1] Under import price variation, mutton supply elasticity is .36 and cross-supply elasticity for mutton-beef is -.32. Therefore, mutton supply elasticity is inelastic around 1973 prices, but it became more elastic at higher prices, 1.59 and 5.35; cross-supply elasticity at 210-190 is -5.059 which is close to supply elasticity for mutton at that price. However, under the no minimum demand requirements mutton supply elasticity around 1973 prices is very elastic - 2.76, and cross-supply elasticity is -1.90, which indicate a high competition between village mutton production and village beef production for feed resources. Normative supply elasticity derived by linear programming is usually higher than supply elasticities derived by time-series. The reason is the inclusion of new technology in production (house-confinement) and capital investment is assumed to be unlimited. Therefore, there is a trade-off between beef and mutton production, because village feed resources can be completely utilized by mutton, cattle or sheep.

Beef supply functions

Beef normative supply schedule is also derived with the same methods as mutton supply functions. Under regional demand requirements and import

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[1] Supply price elasticity is defined as percentage of change in quantity of a product supplied as a result of percentage changes in price of that product. $Es_i = \frac{\Delta Q_i/Q_i}{\Delta P_i/P_i}$ Cross-supply price elasticity is defined as percentage change in quantity supplied of a product as a result of percentage change in price of another commodity. $Es_{ji} = \frac{\Delta Q_i/Q_i}{\Delta P_j/P_j}$

price variation, beef production starts at 30 rials/kg and it reaches maximum at 210 rials/kg. Beef supply cannot go beyond 24,732 tons or 99 per cent of requirements, even at higher prices under feed-resource constraints. At low price levels, beef production comes from dairy cows as by-products. However, at 60 rials per kg, the imported beef fattening activity enters the solution, and it reaches its highest production level at 80 rials.[1] At the 160 rials price for beef-selling activities, native cattle production starts, and remains constant at all prices above that (see Table 36).

The beef-supply and cross-supply elasticities are varied as beef prices change. At prices above 1973 prices, supply elasticity is 1.58 and cross-supply elasticity (beef-mutton) is -9.78. At prices above 200, beef supply is inelastic and elasticity is .131, where cross-supply elasticity is -2.10.

Under the non-minimum demand requirement, beef production starts at 110 rials reaching the maximum at 160 rials. This is different from the supply schedule where minimum demands for livestock products were imposed. At higher prices (above 1973 prices), beef production increased from 10,375 to 24,015 tons. This increase in production is not at the expense of a reduction in mutton supply. This additional supply comes from fattening of imported cattle with the unutilization of feed residue and imported feed resources from other regions. The major reduction in

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[1] One reason that beef fattening starts production at lower prices than other activities is that imported cattle has already consumed a certain amount of feed resources from other regions, and beef production for per unit of feed consumption in the region is higher than other beef production activities.

the mutton supply occurs when the beef price reaches 150 rials, mutton production decreases from 7,421 to 1,815 tons and all the sheep-raising activities drop from the solution except for house-confinement, which is not competitive. Part of range production becomes unutilized, 360,876 tons or 64 per cent of range production, implying that all other resources were used for beef production, Since a small percentage of foods for sheep-raising are non-range, therefore sheep range production is eliminated as that supplementary food becomes scarce.

Poultry supply functions

Poultry production is the most efficient in feed conversion of livestock husbandry in Iran. Although most feed resources for poultry production is imported, under no capital constraints, poultry production is more profitable than other activities. Poultry activities do not compete with other livestock activities for feed resources; therefore the cross-supply elasticity for poultry with mutton and beef is zero.[1]

Supply schedules for poultry are derived under two different assumptions (see Tables 38-39 and Figures 14-15). Under minimum-demand requirements for regional livestock products and import-price variations above the selling price, production starts at the low level of prices. At 10 rials, production is 1,454 tons, which is from the by-products of egg production. At higher prices, production increases and it reaches the minimum demand requirement at 50 rials. The maximum demand will not be reached until 90 rials.

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[1]Only small percentages of barley and alfalfa are utilized in poultry production.

The poultry production schedule is different, with no minimum-demand requirements. The production schedule is the same at the low price level, 10 rials with the previous supply schedule, but it has different responses to price changes. Production reaches 4,380 tons at 10 rials, but it reaches the maximum requirement at 110 rials.

Poultry elasticities range from .668 at the low price to 3.669 at prices around the 1973 price level in supply functions under no-minimum demand requirements. However, supply elasticities under import-price variation range from 1.003 at low prices to 4.06 and 3.83 at the higher levels. At prices around the 1973 price level, the supply elasticity is 1.103.

Generally, the poultry industry is based on imported feed from foreign countries. Therefore, expansion of the poultry supply depends mostly on the level of imported feed and costs of imports. In the linear programming model, one of the feed ingredients in poultry production is assumed to be wheat. The inclusion of wheat represents two major points in the poultry industry. First, the poultry industry can compete for feed-grain with direct human consumption in case of scarcity of other feed resources, or lower wheat prices relative to other feed resources. And second, corn and wheat are substituted easily if the cost of one changes in contrast to the other one.

Milk supply schedule

The milk supply is derived for Tehran region. Milk production starts at 13 rials per kg, reaching to maximum demand at 35 rials (see Table 40 and Figure 16). The major feed resources in dairy ration

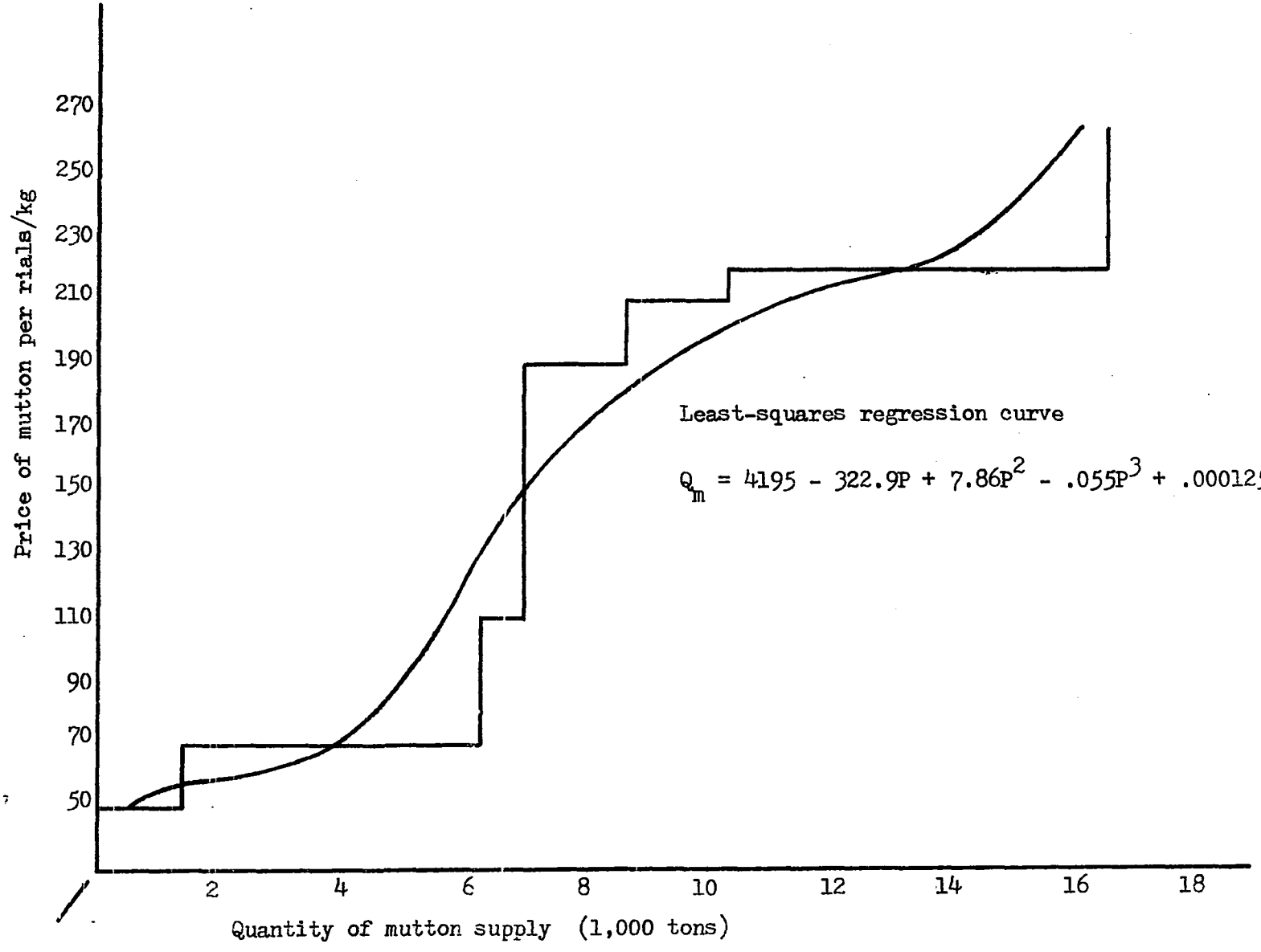

Figure 10. Mutton supply for Tehran Ostan

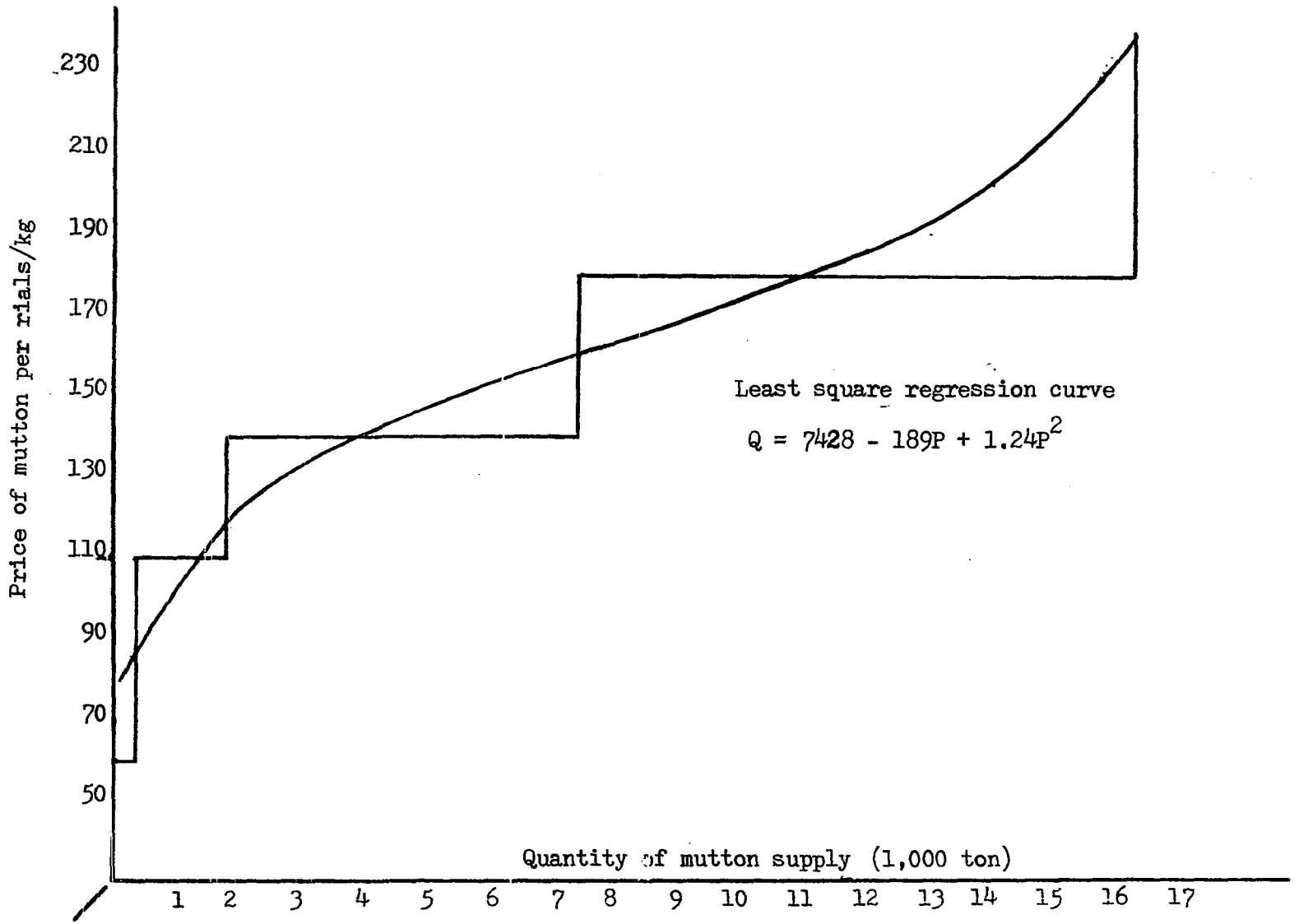

Figure 11. Mutton supply with no minimum-demand for Tehran Ostan

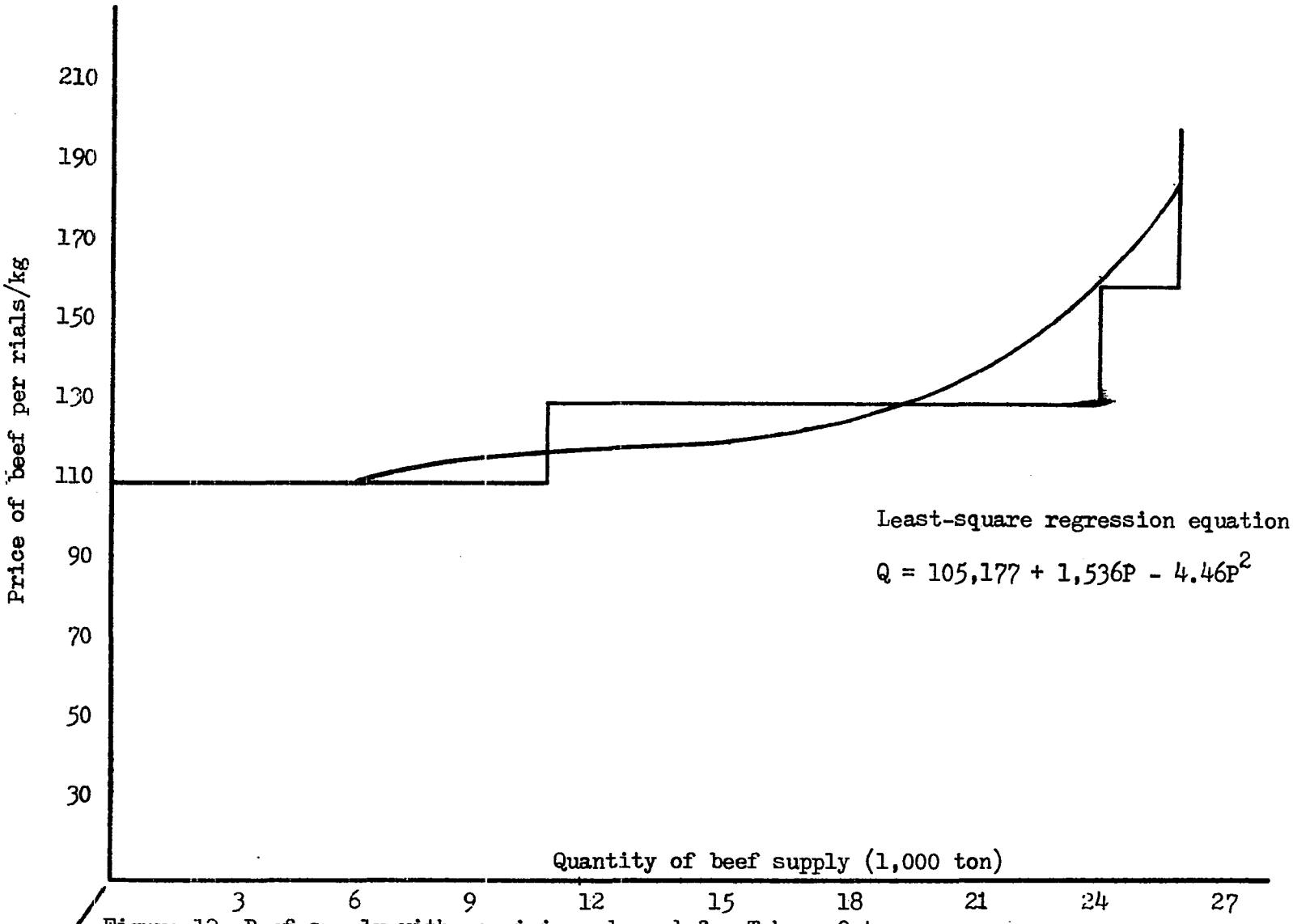

Figure 12. Beef supply with no minimum-demand for Tehran Ostan

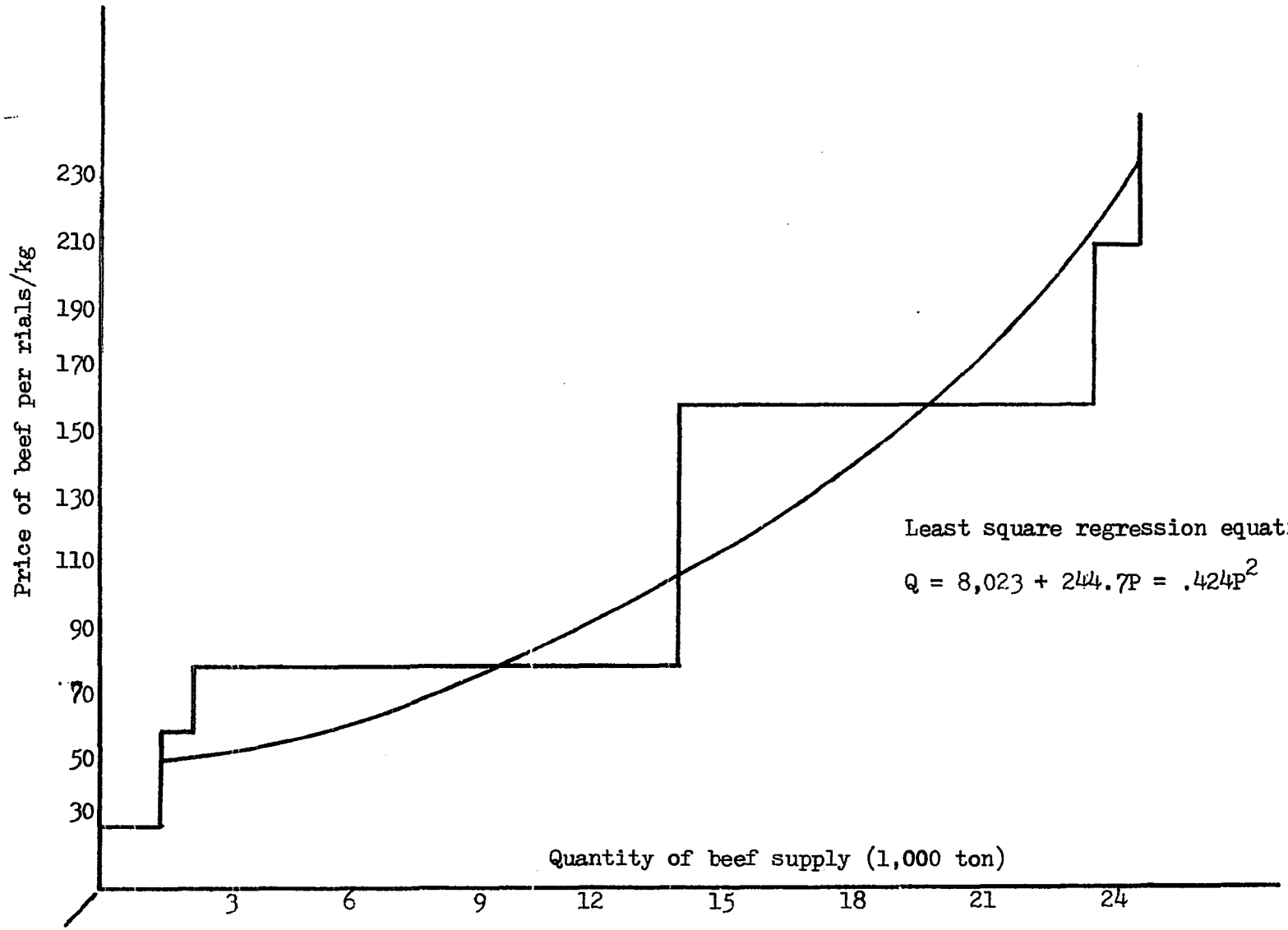

Figure 13. Beef supply for Tehran Ostan

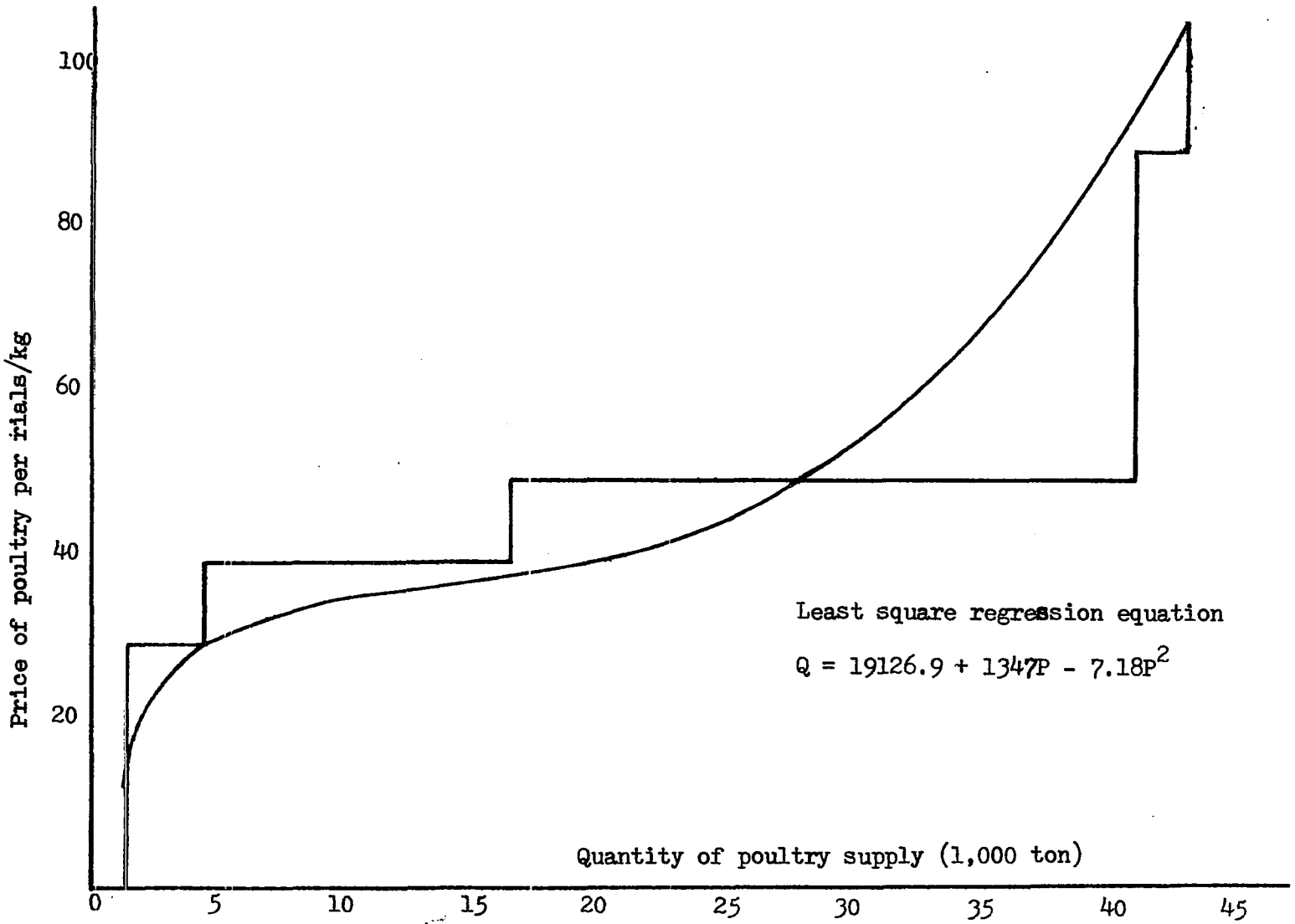

Figure 14. Poultry supply for Tehran Ostan

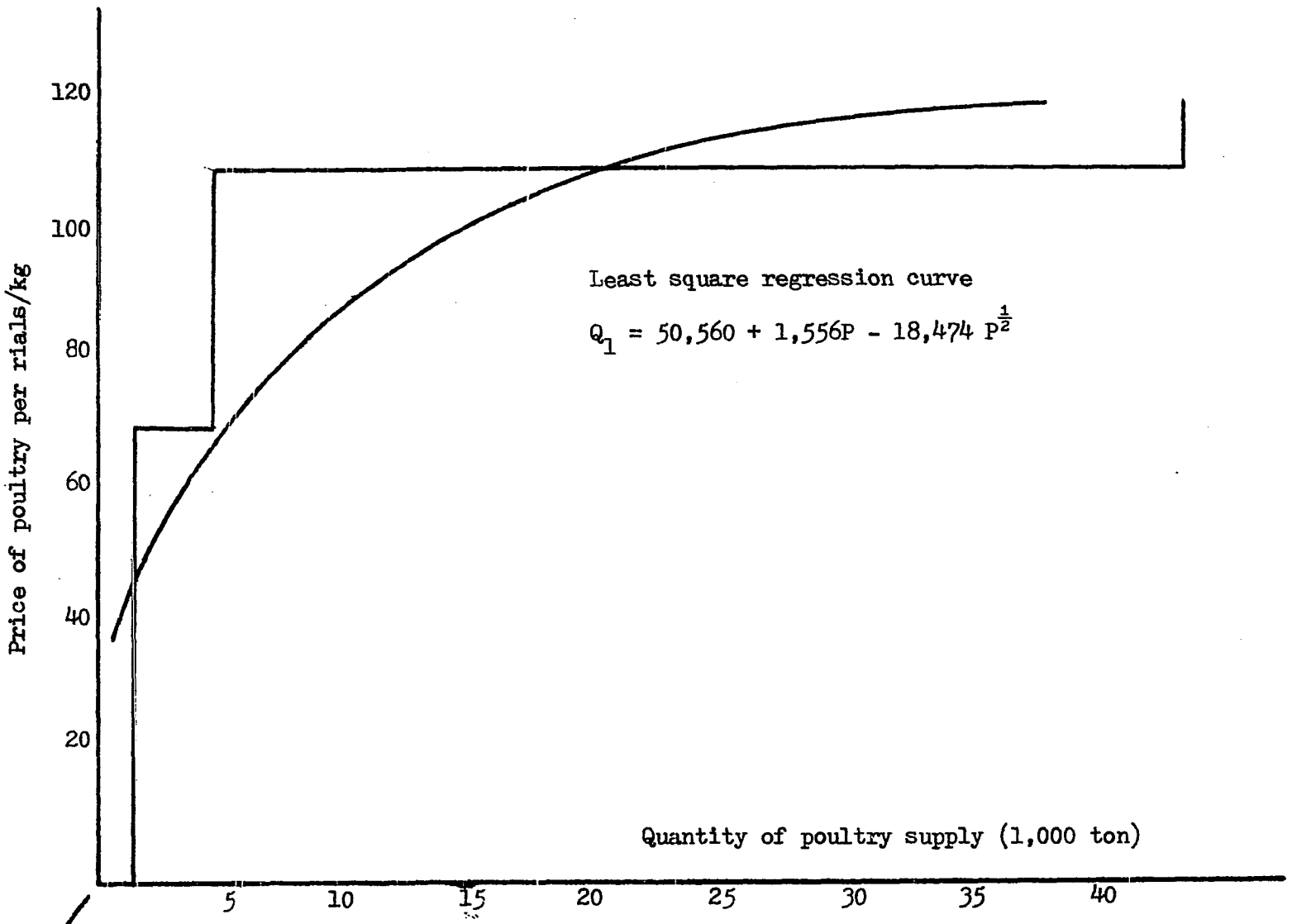

Figure 15. Poultry supply with no minimum-demand for Tehran Ostan

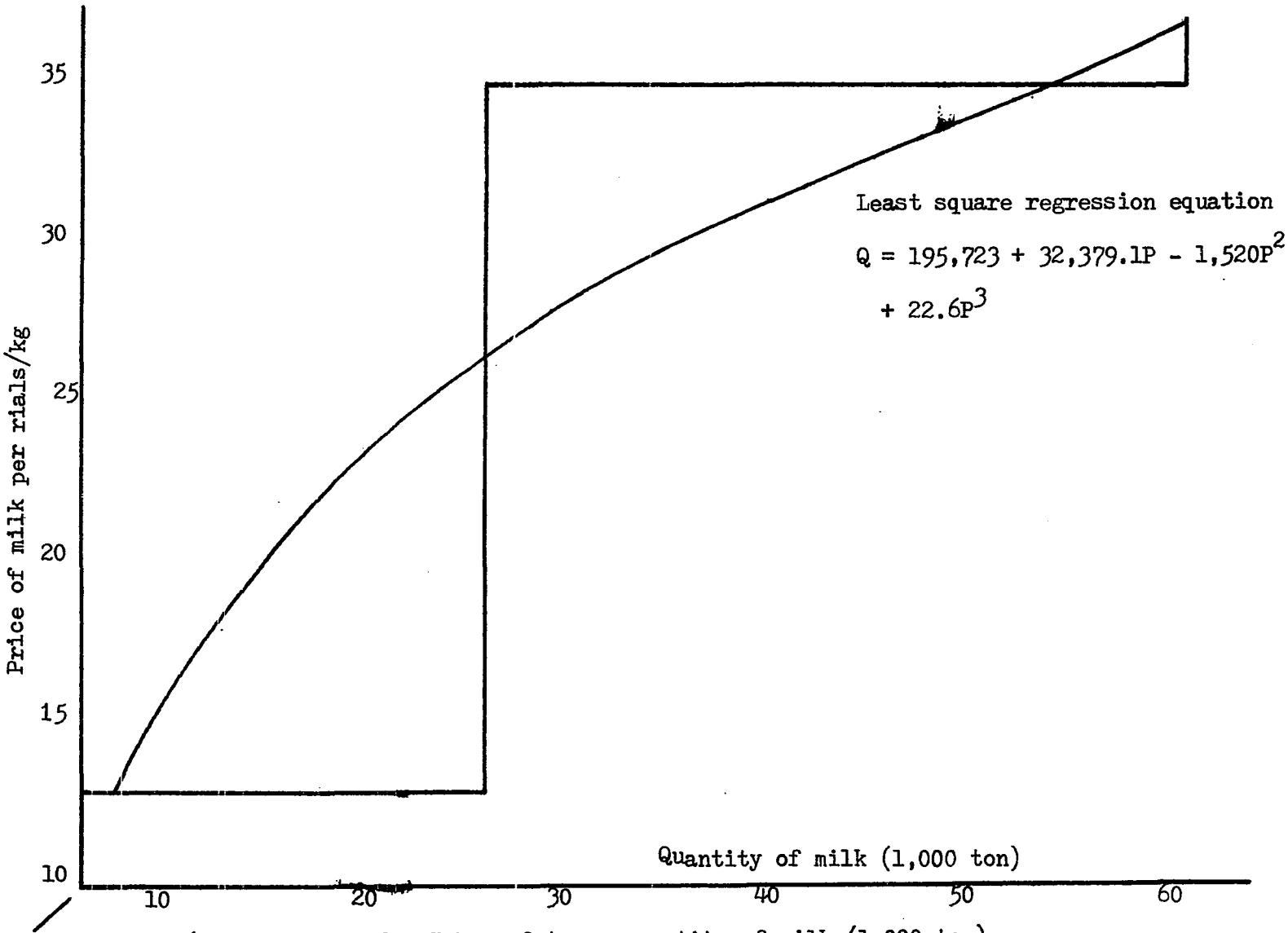

Figure 16. Milk supply for Tehran Ostan - quantity of milk (1,000 ton)

are assumed to be sorghum, in which the region is deficit. Alfalfa or some other fodder crops can be substituted perfectly for sorghum, but this requires pulling more resources from other livestock activities.

The milk supply function and cross-supply functions with mutton and beef shows that mutton production is not effected very much by milk production. Cross-supply elasticities for milk-mutton are very small, -.048. Where beef cross-supply elasticity is positive, .038, therefore dariy production increases beef supply (see Table 40).

Evaluation of Supply and Cross-Supply Schedules for Livestock in Tehran Ostan

Generally, the supply of livestock products in the region cannot expand without an increase in feed production or feed imports. Mutton production in particular is hindered due to range-production limitations, and also minimum forage requirements. Sheep-production activities are competitive with beef-production activities, in particular partial range cattle activities. Sheep fattening can increase mutton production, but its expansion is limited due to the numbers of sheep and their gaining limits. Iranian sheep breed at a certain weight level and produce more fat than meat. Hence, as fat production feed costs almost two times more than meat production, and its price is lower than the meat, fattening sheep at a higher weight cannot be economically justified.

Therefore, a large deficit in mutton supply cannot be met by sheep fattening or house-confinement activities with the feed resource limitation. Village sheep production is competitive with the range-sheep

activity and partial range-cattle activities. As long as the range resources are available cheaply, feeding animals cannot compete with range-sheep activities.

Beef-supply production can be expanded mostly by fattening of imported lean cattle or native cattle activities. In particular cattle fattening from imported cows can increase the supply of beef substantially. Beef produced from dairies as by-products cannot substitute for beef production from the other activities, but its share of the supply will increase when the dairy activities expand. In fact, the higher beef prices will encourage dairy producers to expand their activities, and will decrease milk cost per unit.

Beef-supply expansion depends entirely on feed costs and market demand. Beef price increases in recent years, relative to mutton and to access to cheap feed resource (sugar beet pulp and molasses) and to government subsidies for feed resources, make fattening a profitable enterprise. But in the absence of these factors, beef production only at higher prices can be expanded to meet the market demand.

Poultry production uses imported feed resources and does not compete with other livestock activities for feed resources in the region. Poultry-industry development can be limited by capital investment and higher price of feed imports. Egg supply in particular can meet demand requirements as long as cheap capital investment is available.

Dairy-industry development depends on fodder crop production and the expansion of fodder crops production can facilitate milk supply expansion. Commercial dairies with exotic cows outweigh commercial dairies with inefficient native cows. Expansion of the dairy industry in

the future will depend on the number of exotic and cross-bred cows, which will eliminate the native cows in commercial native dairy firms.

Feed resource limitations remain the greatest obstacle in livestock industry development in the region. Soybeans, barley, corn and sorghum are the most important imported feed grains in the region. Sugar beet and cotton seed meal are the main feed residue imported by the region's livestock industry. These by-products of sugar beets and cotton production are limited by production of these crops, which and will reach their limits in a short time. The only two abundant resources in the region are straw and bran. However, straw utilization is necessary in construction activities, leaving bran as the only under-utilized feed resource in the region.

Capital limitations

Three different types of capital are introduced in the model. Capital investment or long-term capital borrowing, capital borrowing (short-term) for operation costs, and foreign exchange elements of capital investment (long-term) have different effects on livestock production.[1]

The capital investment limitation caused the egg production activity to decline first. Further limitation on capital borrowing from 4 billion

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[1]Capital investment includes activities such as building, equipment, storage and other development investments for the long-run. Capital short-term borrowing includes activities such as feed and livestock buying and operation costs for at least three months, except for dairies. Foreign exchange capital borrowing includes equipment and livestock imports required from the other countries as part of total investments.

Table 34. Supply and cross-supply schedules for mutton and beef in Tehran Ostan

Mutton prices (rials)	Production	
	Mutton (ton)	Beef (ton)[b]
10	---	25,012
30	---	25,012
50	1,356	25,012
70	6,274	25,012
90	6,274	25,012
110	6,962	24,732
130	6,962	24,732
150	6,962	24,732
170	6,962	24,732
190	8,596	23,866
200	8,596	
210	10,270	21,755
220	16,482	13,921
230	16,482	13,921

[a]Import price of mutton is varied.

[b]Beef and poultry prices are constant at 120 and 95 rials.

Table 35. Supply of mutton for Tehran Ostan under no minimum-demand requirements

Price (rials)	Mutton Quantity (ton)	Beef Quantity (ton)
10	---	10,626
20	---	10,826
30	---	10,626
40	---	10,626
50	---	10,626
60	345	10,626
70	345	10,626
80	345	10,626
90	345	10,626
100	1,815	10,626
110	1,815	10,626
120	1,815	10,626
130	1,815	10,626
140	7,421	10,626
150	7,421	10,375
160	7,421	10,375
170	7,421	7,421
180	15,307	0.0
190	15,307	0.0
200	15,307	0.0
210	15,307	0.0

Table 36. Normative supply and cross-supply for beef in Centeral Ostan

Beef prices	Production		Beef supply elasticity	Beef-mutton cross-supply elasticity
	beef (ton)	mutton[b]		
10	---	18,835		
30	1,471	18,835	.727	0
50	1,471	18,835		
60	2,412	18,835		
70	2,412	18,835		
80	13,921	16,482	4.93	-.99
90	13,921	16,482		
110	13,921	16,482		
130	13,921	16,482		
150	13,921	16,482		
160	23,866	8,596	1.58	-9.74
170	23,866	8,596		
190	23,866	8,596		
210	24,732	6,962	.131	-2.10
230	24,732	6,962		

[a]Price of imported beef is varied.

[b]Selling price of mutton is 150 rials.

Table 37. Supply of beef in Tehran (no minimum demand required) mutton price: 150 rials; poultry price: 95 rials

Prices (rials)	Beef supply (ton)	Mutton (ton)
10	----	15,307
20	----	15,307
30	----	15,307
40	----	15,307
50	----	15,307
60	----	15,307
70	----	15,307
80	----	15,307
90	----	15,307
100	----	15,307
110	10,375	7,421
120	10,375	7,421
130	24,016	7,421
140	24,016	7,421
150	24,016	7,421
160	26,295	1,815
170	26,295	1,815
180	26,295	1,815
190	26,295	1,815
200	26,295	1,815

Table 38. Poultry supply schedule (no minimum-demand)

Prices (rials)	Poultry Quantity/ton
10	1,455
20	1,455
30	1,455
40	1,455
50	1,455
60	1,455
70	4,380
80	4,380
90	4,380
100	4,380
110	42,890

Table 39. Poultry supply for Tehran Ostan

Price	Supply (ton)	P10 unit	P10 kg	P11 unit	P11 kg	P37 unit	P37 kg
10	1,454			1,785			
20	1,454			1,785			
30	4,380			1,785		1,887	
40	16,482			1,785		25,442	
50	40,890			1,785		25,442	
60	40,890			1,785		25,442	
70	40,890			1,785		25,442	
80	40,890			1,785		26,742	
90	42,890			1,785		26,746	
100	42,890						
110	42,890						

Table 40. Normative milk supply for Tehran Ostan and cross-supply schedules for milk, mutton and beef

Prices	Milk (ton)	Beef (ton)	Mutton (ton)
5.00	---	10,375	7,421
7.00	---	10,375	7,421
9.00	---	10,375	7,421
11.00	---	10,375	7,421
13.00	26,361	11,121	7,188
35.00	62,000	12,130	6,837

rials to 3 billion rials dropped egg production activities to zero, and the commercial dairy activities with exotic cows were reduced.

Broiler and sheep activities increased by .5 per cent and 14 per cent respectively. Other activities were not affected by a reduction in capital investment borrowing activities.

Supply functions for the livestock products derived in Tehran Ostan are under unlimited capital resources with low level interest rates (7, 1, and 11) which actually are subsidized by the government, since in commerical banks, interest rates are much higher. Under the limited or the higher costs of capital borrowing cost of livestock, commercial activities with heavy capital investment will lose some of their advantages in comparison with the other traditional or less capital-intensive livestock activities.

Cattle and sheep fattening are next in line to be affected by capital-investment limitations. The range sheep activity, the village sheep activity and cattle partially on range feed are not affected with a limitation on capital.

The operation cost or short-term borrowing is the most limiting factor after feed resources for livestock fattening operations. The effect of limiting the short-term credit will eliminate that additional weight which can add to the existing one. Broiler activities are also effected by the capital borrowing limitation, to a lesser extent.

Changes in Feed Resources

Projected future range production in the region is not very optimistic. FMC projections for range production in Tehran Ostan in

1980 are only 3 per cent (20 thousand tons) higher than for 1973. However, it is estimated that the potential capacity for the long-run (80-100 years) is more than 5.2 times that of the 1980 production. Therefore, in order to develop the livestock industry in the region, other kinds of feed resources must be considered as alternative policies to development.[1]

It has been projected that during the Fifth Development Plan (1972-77) with the utilization of underground water and the construction of new dams (Saveh and Taleghan), 19,250 hectares of new land will be under cultivation in the Centeral Ostan (82). Since these lands are irrigated lands, they can be allocated for all types of crops. How much will be devoted to feed production depends on market prices, production costs and producer attitudes toward production of certain crops.

In order to investigate feed-resource development effects among livestock in Tehran Ostan, assumptions were made. First, it was assumed that all new lands will be devoted to barley production (no land will be available for other crop production); the second assumptions was that all new lands allocated to fodder crop production.[2] The results shown in Tables 41-42 represent a major change in the type of meat production and the composition of methods of production.

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[1]This trend is also true for the whole country. Range-production improvement requires policies over a long period.

[2]This is not very unrealistic, since many projections assumed up to 90 per cent of new lands will be devoted to fodder crop of feed production in the future due to the higher prices for meat and consequently higher prices for feed crops.

In the first case, barley production increased to 122,820 tons and pasture production to 115,680 tons. Under no minimum-demand requirements and restricted cattle imports (to 15,000), an increase in barley production will decrease mutton production by 22 per cent (from 7,420 to 5,057 tons), with a corresponding beef production increase to 17,938 tons, more than 70 per cent from the original program.

Some barley production will remain unutilized, but due to the substitutability of barley with wheat, in this case wheat imports will be eliminated. However, the region will still be deficient in cotton seed meal, corn, sugar beets, bran, soybean and sorghum. Clover is the one crop whose utilization depends on village mutton production. Although it is competitive with alfalfa, due to limited substitutability, it remains unutilized.

Allocation of land to alfalfa production, on the other hand, increases mutton production in the region. Mutton production will increase to 11,012 tons, with 48 per cent coming from house-confinement. Therefore the direct effects of greater alfalfa production will be in the production of more mutton from house-confinements (see Table 42).

The house-confinement for sheep production in this model is assumed to be highly efficient in reproduction, feed-meat consumption and, with management, low in mortality. Since this high-level efficiency is based on experimental research work, one can ssume that the attainment of such a level of technology in large commercial production scale will follow.

Table 41. Projected livestock production and feed requirements for Tehran Ostan at the end of the Fifth Development Plan (1977) (no minimum demand)

Items	Production			Items	Feed Resource Utilization (ton)			
	Activities unit	Production kg	Percentage		From region	Import buying	Total used	Unutilized
Mutton and goat production		5,057,299	100	Alfalfa	164,000	----	164,000	
range	357,934	3,955,170	78.2	Cotton seed	15,097	36,212	51,309	
village fattening	85,904	824,678	16.3	Barley	81,633	----	81,633	43,367
house-confinement	9,701	277,448	5.5	Corn	20,000	46,650	66,650	
				Straw	122,820	----	122,820	96,219
Beef production		17,938,789	100	Molasses	1,575	----	1,575	2,042
partial range	259,955	10,008,267	55.8					
fattening (range)	77,986	3,343,388	18.6	Sugar beet	14,770	30,676	45,446	
fattening (imported)	15,000	3,115,500	17.4	Bran	33,600	10,461	44,061	
dairies	10,644	1,473,129	8.2	Clover	17,900	----	17,900	
				Sorghum	50,000	48,629	98,629	
Milk production	10,644	52,000,000	100	Wheat	----	34,133	34,133	
Poultry production		28,850,000	100	Soybean	----	20,891	20,891	
broilers	17,674	27,394,700	94.9					
layers	1,785	1,454,775	5.1					
Egg production	1,785	13,186,000	100					

[a]All new lands allocated for barley production.

Table 42. Projected livestock production and feed requirements for Tehran Ostan at the end of the Fifth Development Plan (no minimum demand)

Items	Production			Feed Resource Utilization (ton)				
	Activities unit	Production kg	Percentage	Items	From region	Import buying	Total used (ton)	Ununtilized (ton)
Mutton and goat production		11,018,469	100	Alfalfa	281,000	----	281,000	
range	426,567	4,713,565	42.8	Cotton seed	15,097	29,488	44,985	
village	-----							
fattening	102,376	982,809	9.0	Barley	46,000	49,198	95,198	
house-confinement	185,877	5,316,082	48.2	Corn	20,000	46,650	66,650	
				Straw	113,418	----	113,418	105,621
Beef production		14,236,860	100	Molasses	1,575	----	1,575	2,042
partial range	202,006	7,777,231	54.6					
fattening (range)	60,602	2,598,007	18.2	Sugar beet	14,770	30,171	44,941	
fattening (imported)	15,000	3,115,500	21.9	Bran	33,600	1,783	35,383	
dairies	5,391	746,114	5.3	Clover	----	----	----	17,900
Milk production		26,361,186	100	Sorghum	50,000	----	50,000	
				Wheat	----	34,133	34,133	
Poultry production		28,850,000	100	Soybean	---	20,891	20,891	
broilers	17,674	27,394,700	94.9					
layers	1,785	1,454,775	5.1					
Egg production	1,785	13,186,000	100					

[a]All new lands allocated for alfalfa production.

Techniques of production

Among different techniques of meat production, range production will reamin unique in its utilization of the cheap feed-resources, i.e. range. The adjustment of sheep numbers to range capacity, along with the fattening of lambs and culled ewes will have substantial effects on mutton production. Village mutton production is more competitive with beef production partially in range. Therefore, any increase in village sheep production will be at the expense of beef production, partially on range.

House-confinement mutton production with high efficiency in feed-meat production is not competitive at the lower prices with other animals, but at higher prices, it will compete with beef and dairy production. The possibility of fattening imported cattle from other regions is the best potential for increasing the beef production in the region. However, the number of animals supplied is restricted to the demand of other regions and the feed resource availability in Tehran Ostan.

Beef production from the exotic dairy cow can increase beef supply in the region, but it requires price incentive and feed availability. The inclusion of new techniques of meat production in the model increased competition among different animals and also brought a new prospect for future meat production, giving more flexibility in production in the region. Supplies derived under the model are more elastic than the actual ones. The most efficient breed with high level of management utilizing high-cost feeds can compete with less efficient animals fed with cheap feed resources at a certain price level.

The main sources of cheap feed resources, sugar beets and cotton

seed, become more scarce as fattening and supplementary feed practices are carried out more by producers. Therefore, the only type of feed resources to develop meat production in the future will be the supply of imported feed or more production of domestic ones, thus making meat production costly.

The elimination of fattening and house-confinement will reduce meat production in the region by a large amount and some of the feed resources such as sugar beet pulp and molasses remain unutilized.

CHAPTER IX. SUMMARY AND CONCLUSIONS

The livestock industry in Tehran Ostan of Iran is increasingly unable to provide the quantity of livestock products desired by the residents of Tehran city. Increases in urban income and rapid population growth due to in migration are responsible for the high demand for meat, milk and poultry products. Demand for high-quality meat and dairy products could continue for many years to increase rapidly in Tehran. Income and living standards could continue to improve for hundreds of thousands of factory and construction workers in Tehran.

The supply of agricultural products in Tehran province expanded rapidly from commercial poultry, Holstein dairy breeds and sheep and cattle feeding, but did not keep up with the growth in Tehran demand in the last decade. Livestock in shipments from other provinces had a slow growth rate. Agriculture and industry in Tehran Ostan are interdependent. Industrialization, a priority target in Iran, requires workers, many who come from the agricultural sector. The agricultural sector in Iran provides a relatively minor market for Iran's industrial products. The industrial growth around Tehran, on the other hand, absorbs large amounts of water and food associated with rural areas. Around Tehran the rate of growth in industry did not decrease employment in the agricultural sector nor cause a shortage of agricultural workers until the 1970's. The percentage of the labor force in agriculture has dropped constantly. Importation of animals and feed from other areas into Tehran would have been accelerated by industrialization, except that the total as output grew too slowly and demand grew in other provinces.

As a result of rapid growth in meat demands and slow growth in sheep supply in the Tehran Ostan area, self-sufficiency in meat products has not been obtained. The lamb meat shortage has been relieved by rapid expansion of poultry. The imports of products from abroad has increased more than 10-fold since 1970. In 1974 meat imports accounted for more than 20 per cent of the total domestic consumption. Governmental subsidies such as direct-consumer, feed, capital-borrowing, low interest, and even direct investment in livestock facilities has not increased meat production fast enough to prevent meat prices from increasing.

Ceiling prices have been placed on meat. A "black market" has developed. Still, meat counters are empty most of the day. Meat animals in Tehran compete for limited feed resources. Large volumes of meat and feed are imported.

Shortages of meat and dairy products supplies in Tehran have become so acute that large amounts of foreign exchange must be spent on imported products. Demand projections and supply estimations for red meat and poultry for the next 10 years indicate a widening Tehran deficit.

Meat supply response requires expansion of feed resources or reduction of animals. Price increases to producers and new techniques of meat production may be useful. Most livestock in Iran are undernourished because current feed resources are not enough to give more than a few animals more than maintenance level.

The limited local feed resources for meat production in Tehran Ostan indicates reduction of numbers and more intensive feeding for production

rather than the extensive maintenance only now practiced. Rangelands are over-grazed and have been depleted. Range is the largest and most traditional source of feed production for livestock in Iran. The optimum number of animals for semi-arid range grazing has been over reached by three to six times. The development of higher levels of feed from range production is a long-run program (over 80 years) and cannot solve the immediate feed shortage problem.[1]

Most feed resources in Tehran Ostan for supplementing range are by-products of cereal, sugar and vegetable crops, residues of food processing plants, such as sugar beet pulp, or crop production in marginal lands. Fodder crop production such as alfalfa or corn silage is limited by irrigation water supply whose highest value is usually fresh vegetables and fruits. Higher prices for feed would justify more irrigation of fodder crops, but more feed would mean less food production.

The main problem of this study is to find the optimum allocation of current feed resources among different types of livestock. Meat production was optimized under different assumptions of import prices and minimum demand.

Results of the Study

A set of linear equations simulating the alternatives and constraints on meat production in Tehran Ostan was developed to investigate the competition among alternatives facing the population. Dairies and poultry production in Tehran use new techniques of production and

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[1] FMC projected the potential of Iran's range-capacity production at 21 million tons, more than five times present estimated production.

developed managers, feed suppliers and processing plants provide opportunities for further livestock development in Tehran Ostan. Only a few livestock producers are familiar with high grain or concentrate feedlot operation. Limited mutton fattening takes place in the winter near Tehran.

Optimum allocation of fixed feed resources (to maximize meat production) was planned among different types of animals and production techniques. Linear programming provided a way to optimize the simulation model. Three different assumptions were used: 1) a minimum-demand requirement with fixed import prices; 2) a minimum-demand requirement with import prices always 10 per cent above local prices; and 3) no minimum-demand requirement and fixed import prices.

The results indicate Tehran will be deficit under all demand an import price circumstances in mutton production. Beef production can be expanded to near self-sufficiency. Poultry production, which is based on imported feed resources, can always meet the demand requirement, if enough imports and capital resources are available. Egg and milk production show mixed results. Egg production could supply more than Tehran consumption needs. Milk production can meet demand only if the feed resources, such as alfalfa, are produced in the region and expanded and milk prices are high.

Milk producers are sensitive to milk price levels. Under low price levels, less efficient milk producers, namely those dairies with native cows, would not be included in an optimum plan for Tehran Ostan.

National policies are important tools in livestock development in Iran. Range development, the largest and cheapest feed resource,

requires long-run protection and improvement. Mutton production depends on range capactiy and stocking rates. Larger mutton production from the present livestock population requires supplementary feed.

Meat-price subsidy and feed subsidy assist only a limited number of consumers and producers in and near Tehran. The bulk of consumers and producers in rural areas of the Ostan do not benefit from the program. Urban black markets and low fixed producer prices are prevalent. There is an urban meat shortage, in spite of large imports.

Feed subsidies went mostly to commercial producers and ignored the significant production from nomads and villagers. The supplementary feed programs provided by regional development projects (the Ghazvin and Varamin projects), seem to provide results that are satisfactory. However, as long as supplementary feed supplies cost money, livestock producers seem to prefer free range even with less efficiency, longer time and less weight. More meat production from villagers and nomadic flocks seem to depend on charging for the range, limiting access to it and expansion of supplementary feed supplies.

Livestock expansion in villages is purely supplementary to the limit of pasture and crop residues around the village.

The analysis of the feed import policy for beef, mutton and chicken production as compared to meat import policy from the standpoint of employment, consumer taste and preference, foreign exchange burden and cost of production showed that, in most cases, feed import has its advantages over importation of meat.

Among different types of meat production, poultry and beef production can be expanded faster than mutton production. Mutton pro-

duction expansion is limited by feed resource availability more than are other types of meat production.

Full house-confinement of livestock required large investment, and meat produced under this system are more expensive than that produced under other techniques of production. Hence, at this stage of livestock development, the priority for meat production must be given to sheep and cattle fattening.

Feed subsidies, through government agencies by means of imported feed grain, has the effect of not inducing domestic feed producers to expand their production. However, higher prices for domestic meat will encourage domestic livestock production and, consequently, feed production.

Native cows for milk production are substituted with Holstein which are more efficient in milk production, and future milk development will depend on the growth of their numbers and other cross-bred cows. However, their contribution to beef production will not be very significant.

Self-sufficiency in poultry, milk and beef can be achieved provided there are capital and price incentives. However, self-sufficiency in mutton cannot be expected to occur simultaneously.

ACKNOWLEDGMENT

I would like to express my sincere appreciation for the assistance and guidance rendered me by my major professor, Dr. Arnold Paulsen.

APPENDIX A: ACTIVITIES, RESTRAINTS AND INPUT-OUTPUT COEFFICIENTS OF LINEAR PROGRAMMING MODEL

The Activities

P01

Range sheep production (flock of 100 ewes). The unit of activity is one mature ewe. Meat production 11.05 kg

Net income rials 500

Assumptions: Breeding rate 70%

Mortality 15

Culling rate 20

Off-take rate 25.6

P02

Village sheep production (flock of 100 ewes). Partial range; the unit of activity is one mature ewe. Meat production 16.53 kg

Net income rials 600

Assumptions: Breeding rate 80%

Mortality 5

Culling rate 20

Off-take rate 34.5

P03

Village sheep production (winter feed and some supplementary feed). The unit of activity is one mature ewe.

Meat production 19.90 kg

Net income rials 670

Assumptions: Breeding rate 95%

Mortality 3

Culling rate 20

Off-take rate 40.8

P04

Sheep confinement production. The unit of activity is one mature "kallakui" ewe.

Meat production 28.60 kg

Net income rials 470

Assumptions: Breeding rate 120%

Mortality 3

Culling rate 16

Off-take 46.7

P05

Native cattle partial range. The unit of activity is one native cow.

Meat production 38.5 kg

Net income rials 6,000

Assumptions: Breeding rate 70%

Mortality 10

Culling rate 16

Off-take rate 20.4

P06

Commercial dairy cow (native). The unit of activity is one native dairy cow.

Meat production	65.65	kg
Milk production	590	kg
Net income rials	-32.98	
Assumptions: Breeding rate	80%	
Mortality	6	
Culling rate	35	
Off-take	30	

P07

Feedlot beef production. The unit of activity is one steer imported from Azarbaijan.

Meat production	184.8	kg
Net income rials	-16,860	
Assumptions: Mortality	5%	
Fattening period	136	days

P08

Feedlot beef production. The unit of activity is one steer imported from Khorasan.

Meat production	253.5	kg
Net income rials	-22,301	
Assumptions: Mortality	5%	
Fattening period	120	days

P09

Commercial dairy production (exotic cows). The unit of activity is

one Holstein cow.

Meat production	138.38	kg
Milk production	4,890	kg
Net income rials	-20,868	
Assumptions: Breeding rate	90%	
Mortality	4	
Culling rate	20	

P10

Commercial poultry production (broilers). The unit of activity is one thousand chickens.

Meat production	1,550	kg
Net income rials	-47,767	
Assumptions: Mortality	5%	
Production period	60	days

P11

Commercial poultry production (layers). The unit of activity is one thousand layers.

Meat production	815	kg
Egg production	7,387	kg
Net income rials	-109,253	
Assumptions: Mortality rate	9%	
Production period	18	months

P12

Labor-hiring activity in Spring. The unit of activity is one day.

P13

Labor-hiring activity in Summer. The unit of activity is one day.

P14

Labor-hiring activity in Fall. The unit of activity is one day.

P15

Labor-hiring activity in Winter. The unit of activity is one day.

P16

Alfalfa-buying activity. The unit of activity is one ton of hay.

P17

Cotton-seed-meal buying activity. The unit of activity is one ton.

P18

Barley-buying activity. The unit of activity is one ton.

P19

Corn-buying activity. The unit of activity is one ton.

P20

Straw-buying activity. The unit of activity is one ton.

P21

Molasses-buying activity. The unit of activity is one ton.

P22

Sugar beet-pulp buying activity. The unit of activity is one ton.

P23

Bran-buying activity. The unit of activity is one ton.

P24

Clover-buying activity. The unit of activity is one ton.

P25

Fodder-maize buying activity. The unit of activity is one ton.

P26

Wheat-buying activity. The unit of activity is one ton.

P27

Short-term borrowing activity. The unit of activity is rials.

P28

Long-term borrowing activity. The unit of activity is rials.

P29

Mutton-selling activity. The unit of activity is one kg.

P30

Beef-selling activity. The unit of activity is one kg.

P31

Chicken-selling activity. The unit of activity is one kg.

P32

Soybean-buying activity. The unit of activity is one ton.

P33

Capital borrowing activity (foreign exchange). The unit of activity is rials.

P34

Mutton-buying activity (imports). The unit of activity is one kg.

P35

Beef-buying activity (imports). The unit of activity is one kg.

P36

Chicken-buying activity (imports). The unit of activity is one kg.

P37

Commercial poultry production (less capital intensive in comparison with activity P10). The unit of activity is one thousand chickens.

Meat production 1,350 kg

Net income rials -38,415

Assumptions: Mortality rate 10%

Production period 60 days

P38

Feedlot operation with native calves. The unit of activity is one native steer.

Meat production 42.87 kg

Net income rials -6,493

Assumptions: Mortality rate 5%

Fattening period 115 days

P39

Feedlot operation with native calves. The unit of activity is one native calf.

Meat production 41.04 kg

Net income rials -6,413

Assumptions: Mortality rate 5%

Fattening period 115 days

P40

Sheep-fattening activity. The unit of activity is one sheep.

Meat production gain 9.6 kg

Net income rials -27

Assumptions: Mortality rate 4%

Fattening period 90 days

Restraints

R01

Range production, 563,287 tons of range hay. The B column entry represents tons. Range production is estimated by FMC for the Central zone. The estimate is based on range area and its production.

R02

Pasture and aftermath of crops area, 89,893 tons of pasture hay. The estimate is based on the area under cultivation in central Ostan in 1973.

R03

Alfalfa production, 164,000 tons alfalfa hay. Based on Agricultural Census in 1973.

R04

Clover production hay, 17,900 tons of clover hay. Based on Agricultural Census in 1973.

R05

Sorghum transfer row.

R06

Cotton-see-meal production, 15,097 tons of cotton-see-meal and cake. Based on cotton production in 1974.

R07

Barley production, 46,000 tons of barley. Based on Agricultural Census in 1973.

R08

Corn production, 20,000 tons of corn. Based on Agricultural Census 1973.

R09

Straw production, 219,000 tons of straw. Based on estimate of wheat, barley and rice production.

R10

Molasses production, 3,617 tons of molasses. Based on sugar beet factory production.

R11

Sugar beet pulp (dry) production, 14,770 tons of sugar beets (dry). Based on sugar beet production.

R12

Bran production, 33,600 tons of bran. Based on PFD report on bran purchase in 1974.

R13 to R24

Transfer rows.

R25

Minimum demand for beef, 25,012,000 kg of beef.

R26

Maximum demand for beef, 30,013,000 kg of beef.

R27

Minimum demand for chicken, 40,890,000 kg of chicken.

R28

Maximum demand for chicken, 42,890,000 kg of chicken.

R29

Minimum demand for mutton, 42,562,000 kg of mutton.

R30

Maximum demand for mutton, 72,562,500 kg of mutton.

R31

Minimum demand for milk, 52,000,000 kg of milk.

R32

Maximum demand for milk, 62,000,000 kg of milk.

R33

Minimum demand for eggs, 11,186,000 kg of eggs.

R34

Maximum demand for eggs, 13,186,000 kg of eggs.

R35 to R38

Transfer rows.

Note - Labor, capital (operation, investment, and foreign exchange) are assumed as accounting rows and were unlimited. Later, however, by imposing several bounds, capital constraint effects were analyzed.

Table: 43 Technical coefficients (feed requirement for unit of activities - in ton)

Activities / Feed items	P01	P02	P03	P04	P05	P06	P07
Range (hay)	.846	.410	.228		1.002		
Pasture (hay)		.615	.381		.445		
Alfalfa (hay)		.050	.035	.875	.467	.969	
Clover (hay)		.050	.030				
Sorghum (hay)							
Cotton-seed-meal			.053	.011	.116	.655	.171
Barley	.030	.060	.150	.153	.156	.483	
Corn							
Straw	.100	.150	.250		.304	.517	.029
Molasses							.095
Sugar beet pulp (dry)			.141	.044	.078	.345	.561
Bran					.120	.380	.076
Soybeans							
Wheat[a]							

[a]Wheat and corn are substitutable in feed mixing. Substitution depends on prices, and since wheat prices are fixed by the authorities, sometimes wheat can be used in rations at less cost than corn.

P08	P09	P10	P11	P37	P38	P39	P40
	1.320		.860		.208	.208	.027
	9.275					.027	
.228	.370	.472	3.317	.515		.193	.055
	.775		.733		.187		
		2.955	8.080	2.985			.082
.133							
.125						.052	.066
.736	.920						
.100	.440						
		1.182		1.315			
			13.270				

Table 44. Coefficients for labor and capital borrowing (units: labor/day; capital/rials)

	P01	P02	P03	P04	P05	P06	P07	P08
Labor-hiring/Spring	.90	.90	1.10	.30	1.8	2.7	.24	.24
Labor-hiring/Summer	.73	.73	.96	.30	1.8	2.7	.24	.24
Labor-hiring/Fall	.73	.73	.96	.30	1.8	2.7	.24	.24
Labor-hiring/Winter	.73	.20	.45	.30	1.8	2.7	.24	.24
Capital borrowing/ short-term	8,000	8,500	9,000	9,705	18,750	26,670	19,364	25,418
Capital borrowing/ long-term				2,980		43,080	2,976	2,976
Capital borrowing/ foreign exchange								

P09	P10	P11	P37	P38	P39	P40
7.3	1.6	4.6	4.5	.24	.24	
7.3	1.6	4.6	4.5	.24	.24	
7.3	1.6	4.6	4.5	.24	.24	
7.3	1.6	4.6	4.5	.24	.24	.40
106,674	4,544	92,762	4,000	7,518	7,538	2,960
172,315	91,500	857,034	30,500	2,976	2,976	
57,438	30,500	264,656				

Table 45. Wages, prices, and interest rates (1974 prices)

Purchasing prices	rials/ ton	Selling prices	rials/ kg	Wages	rials/ day	Capital borrowing	Interest rate%
Alfalfa	6,700	Mutton	150	Spring	300	Short-term operation	11
Cotton seed meal	2,000	Beef	130	Summer	350		
Barley	7,500	Chicken	95	Fall	300	Long-term capital investment	7
Corn	9,500	Milk (cow)	15	Winter	250		
Straw	2,000					Foreign exchange	12
Molasses	1,600	Milk (sheep)	20				
Sugar beet pulp	4,000	Wool	100				
Bran	5,000	Manure	0.600				
Clover	5,000	Eggs	63				
Sorghum	7,500						
Wheat	11,000						
Soybeans	25,000						

APPENDIX B: GOVERNMENT-AFFILIATED AGENCIES IN LIVESTOCK INDUSTRY

Pasture Development Fund (Fodder Bank)

The Pasture Development Fund (PDF) was established in 1971 as an independent financial center affiliated with the Ministry of Agriculture, in order to facilitate livestock production in Iran. Since its establishment, it has had a wide range of activities, including feed distribution, credit extension to livestock producers and feasibility studies for livestock projects.

Under the supervision of PDF, beet pulp, cotton seed cake, and bran has been distributed among commercial livestock producers. Also, PDF imports feed grain from other countries and distributes it among regions deficient in feed supply. In recent years, it has also been involved in the stabilization of feed prices, in which certain minimum guarantee prices have been established. If at any time feed prices decline, the organization intervenes in the market and purchases feed until prices get back to the minimum determined by the Ministry of Agriculture. In case of higher prices for feed, PDF will also intervene and distribute imported feed at the guaranteed prices.

The PDF activities have been concentrated mainly around the big cities with commercial dairies, poultry, and sheep-fattening producers which have the ability to get through complicated, time-consuming administrative procedures. As a result of commercial livestock development, commercial feed consumption has increased substantially. Domestic feed production expansion was not enough to meet rapid increases in feed demand. Consequently, imports of feed grain have increased. Since there

had been no independent storage facilities, the Cereal Organization handled imported feed grain. The distribution of feed grain required storage facilities at the port of entry and the consumption area. the PFD has established three storage units with 55-thousand ton capacity and has planned for four more with 56-thousand ton capacity.

Since commercial poultry, dairies and feedlot operations have a tendency to concentrate in the vicinity of cities, far from feed and feed-residue production areas, the distribution of domestic and imported feed required storage and transportation facilities. The PFD does not have any transportation facilities, and livestock producers are required to provide their own transportation for hauling feed from ports or factories which in some cases could be as far as 1,000 km. This step requires an additional cost to feed consumers and a time-consuming process.

Although the selling prices set by the PFD are 20-30 per cent lower than purchasing prices, transportation costs add 5 to 10 per cent and reduce the feed price difference sold by the PFD and the market price to 15-20 per cent. Most beneficiaries of this program are government-affiliated agencies and large and medium-sized commercial livestock producers. Therefore, still a large number of small producers cannot benefit from the cheaper feed provided by the PFD. The subsidies given by the PFD were 100 million dollars in 1975.

In addition, Centeral Ostan (Tehran) absorbs most of the feed resources provided by the PFD; in 1974, 86 per cent of the cotton seed cake; 35 per cent of the sugar beet pulp; and 70 per cent of the feed

grain distributed in Tehran Ostan. Therefore, Tehran Ostan is the greatest beneficiary of the major government subsidies program. Approximately 79 per cent of the total beet pulp and 95 per cent of the cotton seed cake were distributed by the PFD.

As the demand for feed expands and with feed supply limitations, one can expect a shortage of feed residue supplies and the growth of the black market for cotton seed cake, oil meal cake, and beet pulp in particular, relatively cheap now, in the very near future. These feed resources abundant in the last decade have become exhausted by high domestic demand, and unless some other sources become available in the future, Iran will have to import more of this type of feed residue, since it has become familiar with its nutritional value.

The major deficit areas in beet pulp are Tehran, Gorgon, Mazandron, and East Azarbaijan, whereas the main surplus areas are Khorasan, Fars, Isfahan and West Azarbaijan. The main cotton-seed deficit areas are Tehran and Gillan, while the major surplus areas are Mazandran and Gorgon.

Meat Organization

The Meat Organization was established in 1970 in order to stabilize mutton prices, secure adequate supplies by buying domestically and abroad, and in general taking over the responsibility of meat distribution in Tehran.[1] Later, meat distribution in Isfahan, the second largest city, added to their responsibility. The Meat Organization

[1]Beef distribution is under the Tehran Beef and Veal syndicate and is is separate and independent and operated by the private sector.

in addition to meat distribution in Tehran and Isfahan is also involved in promoting sheep-fattening, meat imports, and other related activities.

Meat imports, particularly of frozen mutton from Australia, were brought in at lower prices than domestic wholesale prices. In order to promote meat production, MO increased the purchase prices in the Tehran market, but prices for meat sold to butchers were held down. Since MO is the only buyers of livestock in Tehran and Isfahan (the two largest meat markets in Iran), under this authority, they can set whatever prices they wish. However, in other cities prices are determined mainly by supply and demand and to some extent with municipal intervention.

Since meat import prices have increased rapidly (see Chapter V) MO, in order to keep retail prices down, has been forced to subsidize the mutton market by more than 33 per cent of the purchase price.

Table 46. Purchasing, selling and amount of subsidies by MO in 1974.

Item	per kg dressed cold weight
Farmers selling price	149.20 rials
added expenses	5.20 rials
Paid by MO	154.40 rials
Sale of by-products by MO	24.40 rials
Sub-total	130.00 rials
Add incidental expense	1.08 rials
Meat costs to MO[a]	131.08 rials
Sold to butchers (wholesale)	82.00 rials
Loss to MO	49.08 rials

Source: Mutton marketing.

[a]Administrative costs and costs of transport from the distribution to butchers are not included.

Table 47. Price of feed sold by Pasture Development Fund (rials/ton)

Barley	cash	7,500
Barley	12 months credit	8,100
Corn	cash	9,500
Corn	12 months credit	10,260
Sorghum	cash	7,500
Sorghum	12 months credit	8,100
Beet pulp (dry)		3,000
Cotton seed	cash	6,240[a]
Bran	cash (sell)	4,500
Bran	cash (buy)	6,500
Molasses (cane)	cash	1,500[b]
Domestic corn	purchase price	12,000
corn	selling price	9,500

[a]Plus 171 rials for each per cent of additional protein (max. 11,000).

[b]At factory in Khuzeston.

Table 48. Pasture Development Fund

	Activities (in tons)		
Feed purchasing	1352	1353	1354[a]
Corn - domestic		600	
- imported	25,000	275,450	300,000
Barley - domestic		10,500	
- imported		219,479	250,000
Meadow - domestic			
- imported		42,232	150,000
Beet pulp distribution		189,651	
Soya			80,000
Cotton seed cake		45,672	60,000

Distribution ----- 238,000 in Tehran
85,000 in other cities

[a]Estimated by PDF.

Other cities' wholesale prices in average for mutton and goat meat are 62 and 63 per cent higher than in Tehran, whereas cattle wholesale prices are 9 per cent lower than in the Tehran market.[1]

The subsidies allocated by the Plan and Budget Organization for 1973, 1974 and 1975 were U.S. $33, 65 and 76 million, respectively

Ghazvin Area Development Organization (GADO)

This organization is involved in a variety of farm and livestock activities in the Ghazvin area. In the livestock sector, they imported high milk-producing sheep known as "Awasin" in order to improve Iranian breeds. This experiment was discountinued later due to some diseases which appeared from malnutrition. Another livestock activity by GADO was to supply feed for the fattening of sheep in villages in winter under their supervision. The results have been successful economically and confirm that feed availability could increase meat production substantially. In addition, incentives to farmers to participate more in this kind of program could lead to more demand for feed in the future and the use of new techniques of livestock production. However, since the program has been carried on in only a small part of the country, other parts are unfamiliar with the profitability of feeding animals.

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[1]The wholesale price reported here is the official one, and illegal prices are much higher than the reported one.

The only other organization involved in this kind of program was Dasht Varamin and Gormsor Development Organization, which also collect milk from producers in that area for commercial use.

Table 49. Marketing of meat in Tehran by MO (rials/kg meat)

Year	Paid to Producer	Less sale of by-products	Cost to MO	Sale to Butchers	Loss to MO
1351	103	30	73	72	1
1352	135	26	109	72	37
1352	150	24	126	72	54
1354	150	26	124	80	44

Table 50. Marketing of imported frozen meat (rials/kg meat)

Year	Price paid rials/kg	Sale to butchers	Loss or gain to MO
1351	62.2	70	+ 7.8
1352	95.2	70	-25.2
1353	98.2	70	-28.2
1354	105.5	72	-33.5

APPENDIX C: DISTRIBUTION OF EXOTIC AND CROSS-BRED COWS IN IRAN

(AUGUST, 1975)

Name of Cities	Exotic Cows					Cross-bred	Number of firms
	Cow	Heifer	Calf	Bull	Total		
Tehran area	21,308	7,358	12,480	2,408	41,554	25,502	282
Tehran Ostan	1,911	852	1,045	130	3,938	6,642	52
Gilan	1,070	216	95	8	2,247	217	2
Mazandran	528	131	90	16	775	1,411	58
Tabriz	314	95	109	12	529	1,435	46
Rezaieh	287	80	---	22	389	1,082	36
Kermanshah	37	13	22	4	76	160	6
Khozestan	1,037	292	318	71	1,819	591	27
Fars	1,352	1,095	842	25	3,355	2,117	34
Kerman	370	190	120	70	750	15,000	20
Khurasan	833	285	408	177	1,703	6,000	102
Isfahan	2,559	1,148	1,148	7	5,077	1,444	25
Kurdistan	40	---	---	4	44	222	4
Siston	79	---	---	3	112	---	1
Loreston	170	---	---	---	170	20	5
Hamedan	501	74	152	12	739	4,522	19
Gorgon	51	---	112	97	175	1,508	16
Zanjan	140	107	122	5	374	903	27
Yazd	170	26	17	5	258	1,357	20
Ilam	---	---	---	---	---	175	Scatter
Charmahal	10	---	---	---	10	70	1
Bander Abbas	4	---	---	---	7	---	1
Total	32,226	10,072	18,202	2,106	64,122	70,448	784

APPENDIX D: ESTIMATED QUANTITIES OF THE COMMON FEEDS IN IRAN FOR RUMINANT LIVESTOCK

Feed items	Total yield m. tons	TDN m. tons	Per cent of total TDN
Straw			
Wheat, irrigated	2,100,000	852,600	34.99
Wheat, non-irrigated	1,300,000	527,800	
Barley, irrigated	475,000	208,890	9.95
Barley, non-irrigated	435,000	183,570	
Rice	887,000	368,312	2.34
Cotton seed hulls	145,000	63,365	1.61
Alfalfa and other irrigated fodder crops	800,000	424,000	10.75
Molasses, beet	240,000	145,000	3.69
Molasses, cane	17,640	10,690	.27
Beet pulp (dry)	240,000	164,880	4.18
Wheat bran	280,000	196,280	4.98
Barley, irrigated	373,560	584,962	14.83
Barley, non-irrigated	400,200		
Rice bran	110,000	67,100	1.70
Cotton seed meal	204,000	146,268	3.71
Total Feed Resources	8,027,900	3,861,855	100.00

Table 51. Offals and By-Products Prices in Tehran Slaughterhouse

Skins and intestine	600-400 rials
Head and leg	70 rials
Liver and heart	90 rials
Tripe	20 rials
TOTAL	680 rials

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